

# POPULAR SCIENCE

MONTHLY

MAY

NOW  
15¢



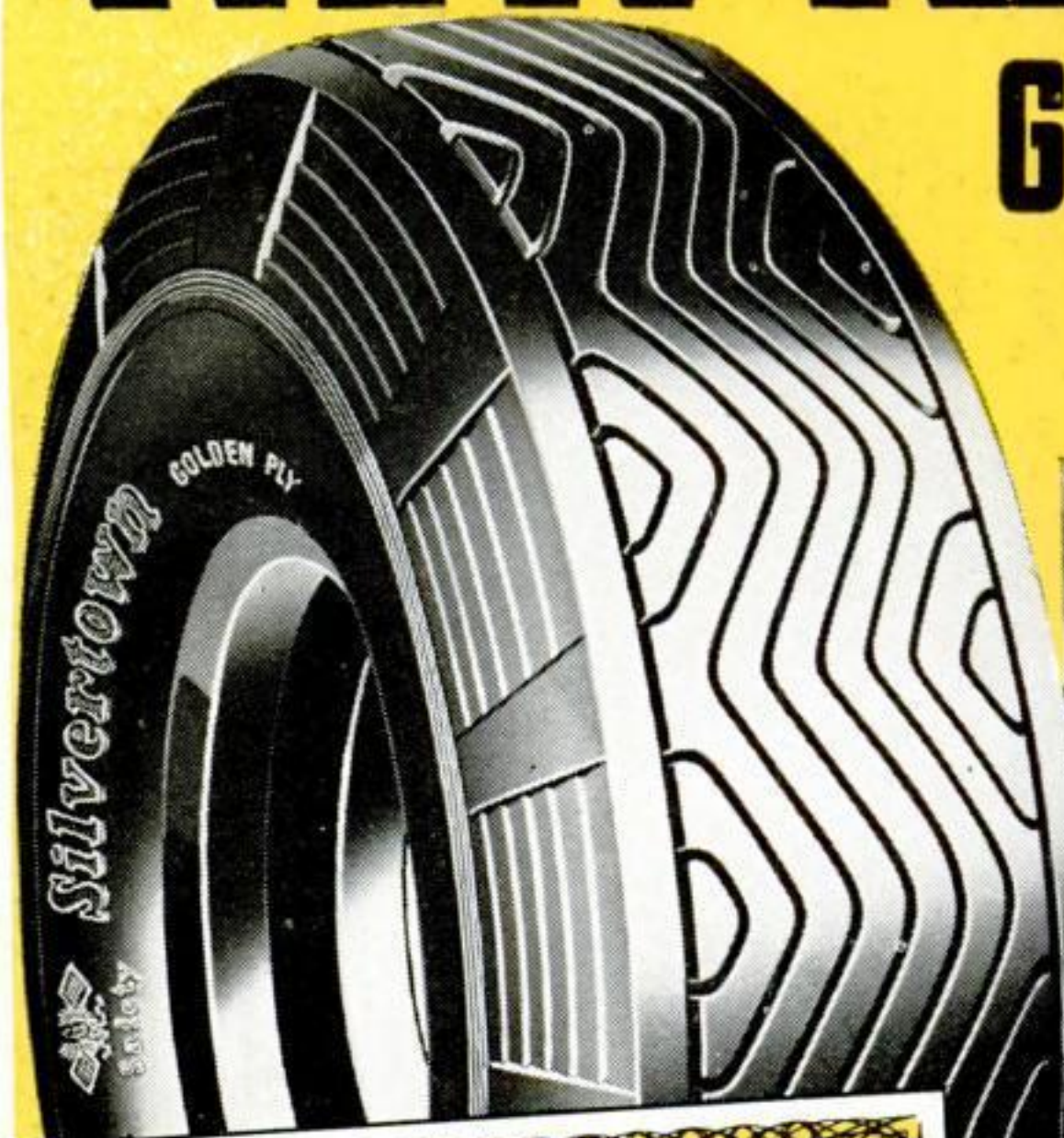
See Page 61

NEW INVENTIONS • MECHANICS • MONEY MAKING IDEAS  
HOME WORKSHOP PLANS AND HINTS • 450 PICTURES



# NEW KIND OF TIRE

GIVES THE *QUICKEST* NON-SKID  
STOPS YOU'VE EVER SEEN!



## HERE'S THE EVIDENCE

from America's Largest  
Independent Testing Laboratory

**BOTH** regular, and also the premium-priced tires of America's six largest tire manufacturers were submitted to a series of exhaustive road tests made over a three months' period by us, to determine their resistance to skidding and wear, with the following results:

"NON-SKID—The new Goodrich Silvertown with the Life-Saver Tread gave greater skid resistance than any other tire tested, including those tires listed at from 40% to 70% higher in price.

"MILEAGE—The Goodrich Silvertown gave more non-skid mileage than any of the other tires tested in its own price range—averaged 19.1% more miles before the tires wore smooth.

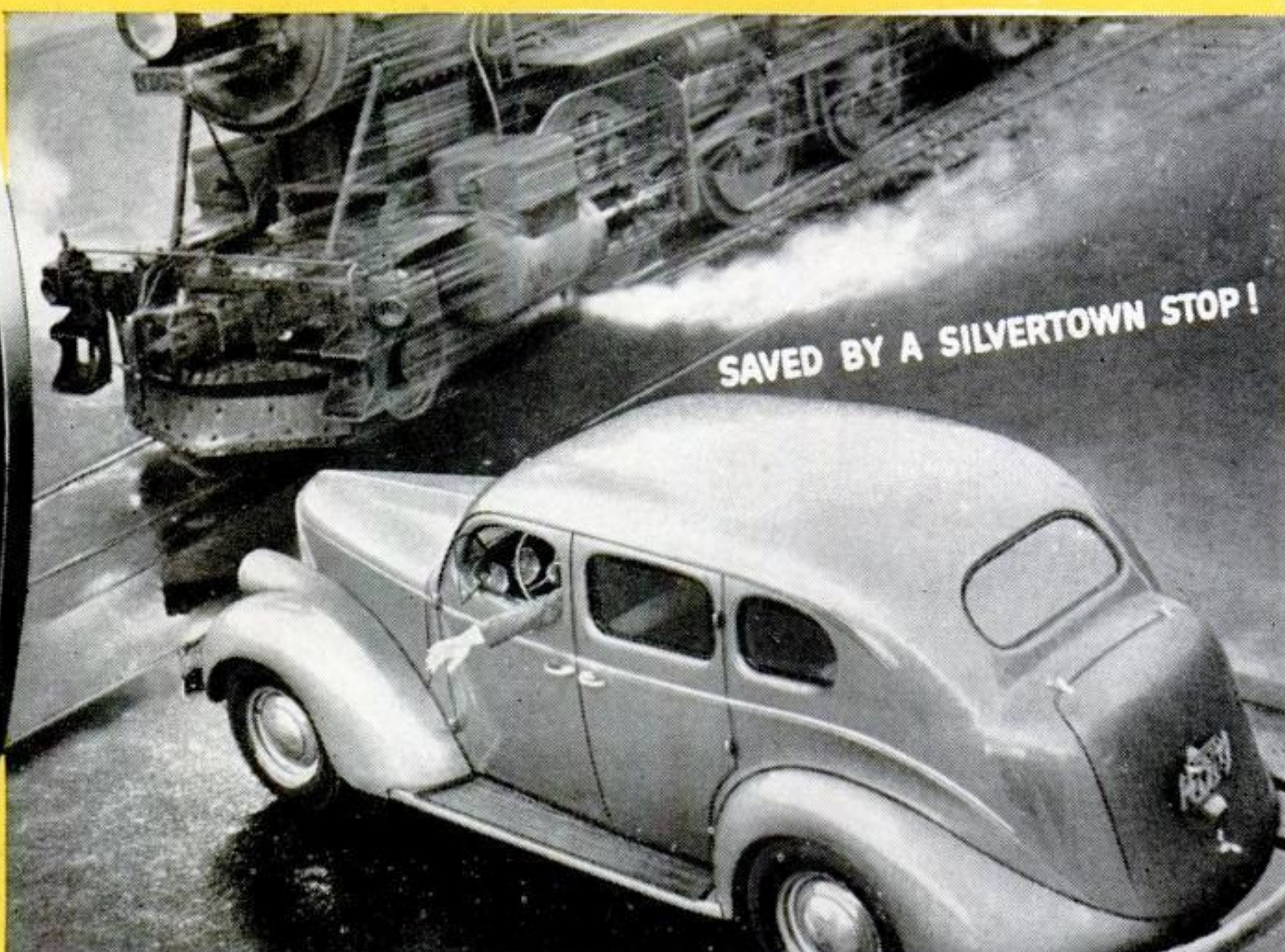
"BLOW-OUT PROTECTION—Despite the severe nature of these tests, no Silvertown blew out, or failed from any cause, while two tires of other makes failed."

A. R. Ellis, Pres.  
PITTSBURGH TESTING LABORATORY



## LIFE-SAVER TREAD WORKS LIKE A BATTERY OF WINDSHIELD WIPERS

Sweeps the water right and left—forces it out through the *deep* drainage grooves. Thus, with Goodrich Safety Silvertowns on your car, you constantly have a dryer, safer road surface for the rubber to grip—in all directions.



## Wins Hands Down in Thrilling Competitive Road Tests Conducted by Famous Testing Laboratory!

**AGAIN** Goodrich makes tire history! Meeting the demands of millions of motorists for greater protection against skidding, Goodrich engineers have perfected a remarkable new kind of tire that conquers wet road skid dangers in a sensational way.

In exhaustive road tests made by the Pittsburgh Testing Laboratory, largest independent testing laboratory in the country, against regular and premium-priced tires of America's six largest tire manufacturers, *no tire tested*—even those costing 40% to 70% more—matched this tire in non-skid action.

### Golden Ply Blow-out Protection

The new Goodrich Silvertown is really *two* great tires combined in one! For *inside* the carcass is the famous Goodrich Golden Ply protection against high-speed blow-outs. And *outside* is the new Life-Saver Tread which stops you quicker, safer than you've ever stopped before. That's because

this amazing tread is actually a *road dryer*! Its never-ending spiral bars, acting like a battery of windshield wipers, sweep water from under the tire, force it out through the *deep* drainage grooves—make a *dry track* for the rubber to grip.

### No Extra Cost!

Go to your Goodrich dealer or Goodrich Silvertown Store for a *free* demonstration that will give you one of the greatest motoring thrills you ever had. Don't miss it, because you'll never know what the word STOP really means until you've felt the grip of this Silvertown on a wet, slippery road.

Remember, this new skid-protected Goodrich Silvertown also has the famous Golden Ply protection against blow-outs. So you get *two* great life-saving features—AT NO EXTRA COST!—to say nothing of 19.1% greater non-skid tire mileage—which means you get EVERY 6TH MILE FREE!

The new Goodrich **SAFETY** Silvertown

SKID PROTECTION OF LIFE-SAVER TREAD ♦ ♦ ♦ GOLDEN PLY BLOW-OUT PROTECTION



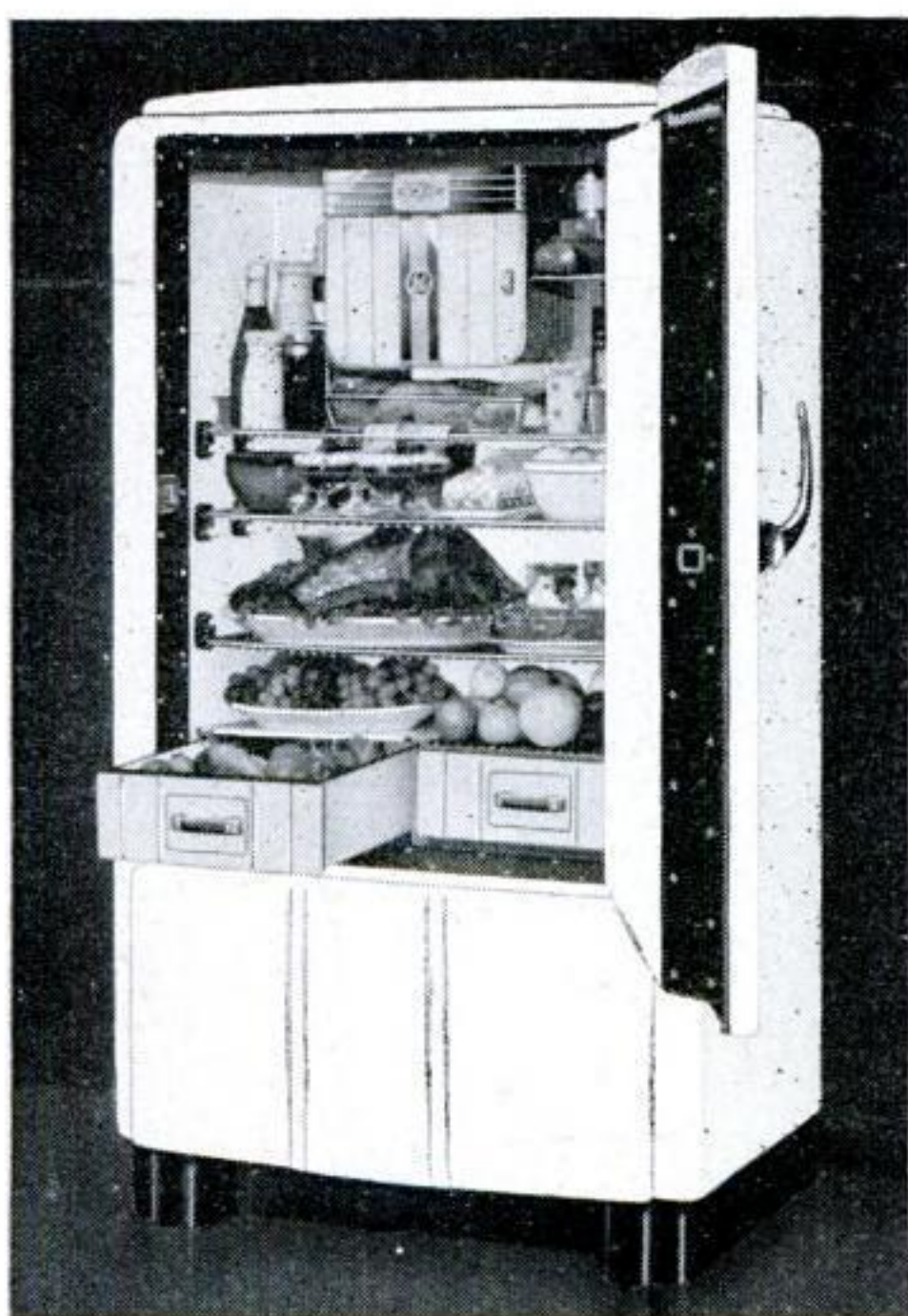
# FIRST CHOICE OF MILLIONS

**NOW  
POPULARLY  
PRICED!**

SEE this refrigerator that started a new "Save Wave" in America—the first choice of millions, now popularly priced. When you buy a General Electric you don't spend—you invest. And you are sure of getting full value for every dollar. For this is a product of the world's largest electrical manufacturing company and has long been a leader in *true economies and multiple savings*. Remember, refrigerator values are not made by words and trick demonstrations.

**Get a Genuine General Electric  
and Save the Difference!**

General Electric *originated* the hermetically sealed Thrift Unit and the 5-Year Performance Protection Plan. No other refrigerator has a sealed cold-making mechanism with a record equal to that of G-E. No other refrigerator, under actual home conditions, can freeze more ice, preserve more food, give more convenience and produce more cold for the little current cost of a General Electric! Its record of low upkeep speaks for itself. *Get the genuine General Electric — not an imitation!*



**TAILOR-MADE INTERIORS!** The new de luxe General Electric cabinets have more flexible and usable storage space, more convenience features. Adjustable sliding shelves, split shelf, tilt-shelf and food containers provide accommodation for practically any food-storage need.

GENERAL ELECTRIC CO., SPECIALTY APPLIANCE DIVISION, NELA PARK, CLEVELAND, O.

## GENERAL ELECTRIC

WORLD'S LARGEST ELECTRICAL MANUFACTURING COMPANY



  
**Triple-Thrift**  
REFRIGERATOR

The new 1938 G-E models climax a 12-year record of ever increasing General Electric values. Last year America bought more G-E Refrigerators than ever before—and today's G-E is even a *better buy!*

**All the Ice You'll Want—In a Hurry!**

New G-E Quick Trays provide instant release of two cubes or a trayful at a time—in seconds—and *without melting*. In six-tray models, 48 lbs. of ice—480 cubes!—can be frozen in 24 hours, and the average cost is less than the market price of ice.



**THRIFTY IN PRICE! IN CURRENT! IN UPKEEP!** Save ALL ways! Look at the price tags, compare values! Check the G-E Refrigerator in current, in upkeep, in long life, in preserving of food, in freezing of ice, in convenience, in saving of time, etc. And we believe you will choose a General Electric!

**OIL COOLING** is a G-E feature that assures quiet operation, low current cost and long life. General Electric introduced the first sealed-in-steel cold-making mechanism 12 years ago. Basically unchanged, but constantly improved, it is now 78% quieter; uses 60% less current; freezes ice 3 times faster; has 56% greater cold-producing capacity.



RAYMOND J. BROWN  
EDITOR

ARTHUR WAKELING, Home Workshop Editor  
ALDEN P. ARMAGNAC, Associate Editor

GEORGE H. WALTZ, Jr., Associate Editor  
SYDNEY OXBERRY, Art Editor

## CONTENTS for MAY 1938

<b>Highways of the Future</b> .....	E. W. Murtfeldt 27
<i>Experts forecast high-speed traffic arteries equipped with amazing safety devices</i>	
<b>Police Cameras Reveal Hidden Crime Clews</b> .....	Grover C. Mueller 30
<i>Photography helps modern scientific detectives in their war on law breakers</i>	
<b>Sailing Midget Ships</b> .....	Arthur A. Stuart 36
<i>Amateur tars go to sea in accurate scale reproductions of famous vessels</i>	
<b>Hospital on Wheels Aids Fire Fighters</b> .....	John E. Lodge 38
<i>High-speed streamline ambulance follows the engines to big-city blazes</i>	
<b>Wild Animals Are His Hobby</b> .....	Edwin Teale 44
<i>A college professor finds relaxation in training wildcats and lions</i>	
<b>Ceiling Zero</b> .....	Robert E. Martin 46
<i>New radio system guides planes to blind landings on fog-bound airports</i>	
<b>Modern Avocado Groves</b> .....	Andrew R. Boone 48
<i>Explorers and plant breeders bring an ancient fruit to your dinner table</i>	
<b>Riches from the Wind</b> .....	Arthur Van Vlissingen 54
<i>Two home mechanics on an Iowa farm get an idea that starts a new industry</i>	
<b>Germproof Operating Room</b> .....	57
<i>Assembly-line methods applied to surgery guard patients against infection</i>	



Balloon-bursting, one of the events in a track meet of the air. Read the article on page 33 describing this new college sport

### AUTOMOBILES

<b>Airless Safety Tire</b> .....	34
<b>Unit Tests Fuel Gauges</b> .....	34
<b>Pump Truck Cleans Oil</b> .....	43
<b>Ruse Traps "Gyp" Gas Vendors</b> ....	52
<b>"Sand Buggy" from Car Parts</b> ....	53
<b>Armored Car Resembles Plane</b> .....	59
<b>Paint Rack Matches Car Hues</b> .....	60
<b>New Push-Button Auto Radio</b> .....	60
<b>Hints for Car Owners</b> .....	87

### AVIATION

<b>Track Meets of the Air</b> .....	33
<b>Plane Motor Adjusts Itself</b> .....	40
<b>Leaps to Glider from Car</b> .....	42
<b>Novel Crane Lifts Seaplanes</b> .....	43
<b>Air Hostesses Learn Make-Up</b> .....	43
<b>Big Plane Is Built of Wood</b> .....	51

### FEATURES AND DEPARTMENTS

<b>OUR READERS SAY—</b> .....	6
<b>NEW IDEAS FOR HOME OWNERS</b> .....	14
<b>THE MAN WITH THE NET</b> .....	51
<b>POPULAR SCIENCE QUESTION BEE</b> .....	62
<b>UN-NATURAL HISTORY</b> .....	63
<b>GUS WILSON'S MODEL GARAGE</b> .....	66
<b>THE HOME WORKSHOP</b> .....	67
<b>ADVENTURES WITH YOUR MICROSCOPE</b> .....	88
<b>HOME-LABORATORY CHEMISTRY</b> .....	90
<b>RADIO DEPARTMENT</b> .....	92
<b>AMATEUR PHOTOGRAPHY</b> .....	96

COVER DESIGN BY EDGAR F. WITTMACK

Published monthly at 353 Fourth Avenue, New York, N. Y., by Popular Science Publishing Co., Inc. A. L. Cole, President and Treasurer; Godfrey Hammond, Executive Vice President; R. C. Wilson, Vice President; John Nichols, Vice President; C. D. Freeman, Vice President; F. W. Briggs, Secretary. Entered as second-class matter Dec. 28, 1918, at the Post Office at New York under the act of March 3, 1879; additional entry as second-class matter at Dayton, Ohio. Entered as second-class matter at the Post Office Department, Canada. Printed in U. S. A. Copyright, 1938, by Popular Science Publishing Co., Inc. Single copy, 15 cents. Yearly subscriptions to United States, its possessions, and Canada, \$1.50; foreign

countries, excepting Canada, \$2. Subscribers must notify us of change of address four weeks in advance of the next publication date. Be sure to give both old and new address. The contents of this magazine must not be reprinted without permission. The editors are not responsible for unsolicited contributions, and cannot guarantee the return of such material or insure against its loss. Contributions not accompanied by sufficient postage will not be returned. In presenting numerous stories of new products of applied science, Popular Science Monthly does not underwrite the business methods of the individuals or concerns producing them. The use of Popular Science Monthly articles for stock-selling schemes is never authorized.



# Electroplating

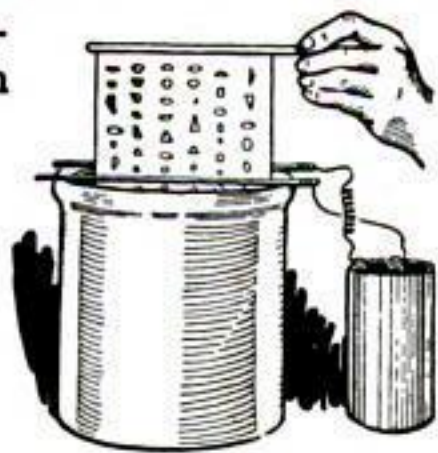
FOR HOBBY OR PROFIT

## ALL YOU NEED TO KNOW IN ONE PRACTICAL HANDBOOK

Written especially for the amateur, this book tells you how to utilize many odds and ends to build a complete home electroplating workshop. Instructions, pictures, and diagrams show how easy you can do copper, nickel, chromium, silver and gold plating. How you can plate household or automobile fixtures, hardware, tools, silverware, ornaments, clocks, watches, bracelets, rings, metal parts of all kinds.

## FOR THE BEGINNER OR THE EXPERT

Takes you in easy-to-grasp stages right from the simple first principles of electroplating to expert professional type work. It's interesting and profitable also to plate non-metallic articles made from wood—fabric—leather—plastics—glass or porcelain. You can get results plating less commonly used metals such as zinc, cadmium, cobalt, antimony, lead, rhodium, and alloys. How to do lacquering, inlaying, overlaying, etching. How to plate unusual designs with contrasting metals for striking effects,—obtain unusual finishes with chemical coloring. Scores of illustrations, diagrams, and pictures make it easy to do electroplating in all its branches.



## YOU CAN MAKE MONEY PLATING FOR OTHERS

Refinishing automobile parts offers an unlimited field for making extra money. A complete chapter, with many detailed drawings shows you how to do professional plating *without removing the parts from the car!* How to nickel or chromium plate automobile radiators, hardware, door handles, headlights, etc., by the hand-electrode method which *requires no tank.* How to touch up worn spots without plating an entire article. *Hundreds* of formulas for making your own electrolytes and chemical coloring baths. This brand new handbook, prepared by the editorial staff of Popular Science Monthly, is right up-to-the-minute and *guaranteed* to give satisfaction. Mail the coupon NOW and examine a copy at our risk. Money back if not satisfied.

**260 PAGES—21 CHAPTERS**



**HUNDREDS OF  
FORMULAS**

**SCORES OF  
DIAGRAMS**

**STURDY CLOTH  
BINDING**

*Send no  
money now*

## MAIL THIS COUPON TODAY

Popular Science Monthly, Dept. 58  
353 Fourth Ave., New York, N. Y.

Please send me your new 260 page, cloth bound, book "ELECTROPLATING." When the book is delivered I will pay the postman only \$2.00 plus a few cents postage, in FULL PAYMENT. My understanding is that after examination, I have the privilege of returning the book within 10 days and you will refund my money in full.

(If you prefer to pay now we pay postage.)

NAME .....

ADDRESS .....

CITY ..... STATE .....

Orders from outside the U. S. must be accompanied by cash.

# CARS START EASIER!

*With New FAST ACTION  
AUTO-LITE SPARK PLUGS*

*Here's the Secret—NEW KONIUM  
ELECTRODE — SPEEDS UP ACTION  
OF ENTIRE IGNITION SYSTEM BY  
SPARKING AT LOWER VOLTAGES*



**IMMEDIATELY, MOTOR CAR  
ENGINEERS PLACED THEIR  
STAMP OF APPROVAL ON THIS  
NEW KIND OF SPARK PLUG  
NOW EXCLUSIVE EQUIPMENT**

**ON:**



PLYMOUTH DE LUXE



NASH-LAFAYETTE



DODGE



DODGE TRUCK



DE SOTO



CHRYSLER



A.M. BANTAM

## AUTO-LITE ENGINEERS SAW NEED FOR NEW KIND OF SPARK PLUG

FOR 26 years the engineers of Electric Auto-Lite have specialized in starting, lighting and ignition equipment for motor cars.

To improve the present-day ignition system was one of their pet aims. To do it, they found they needed a better spark plug than any they could buy. So they perfected a new kind of spark plug—one engineered as an integral, balanced unit of the ignition system *instead of as an accessory.*

They developed an entirely new electrode which, under identical conditions, requires a much lower voltage to produce a spark. *Faster action!* Cold motors start easier! Gasoline waste is eliminated! Top speed is increased!

Get a set of Auto-Lites today. They put new life in your motor—pay for themselves over and over, and over again, in gasoline savings!

**AUTO-LITE  
SPARK PLUGS**



## MODELS

Packaged Model Kits.....	22
Radio-Controlled Air Target.....	50
Miniature Auto Racing.....	52
Tiny Motor Dwarfed by Dime.....	58
Championship Racing Yacht.....	74
Guns for the <b>Alabama</b> Model.....	83
Trees in Miniature.....	106
Subway Line Added to Railway....	107
Straightening Old Track.....	107
Soldering Improves Track.....	108
Model Locomotive Kit.....	108
Model-Railway Signboards.....	109
Freight-Car Model Details.....	109

## NEW DEVICES FOR THE HOUSEHOLD

Modern Kitchen Scales.....	64
Novel Upholstery Cleaner.....	64
Triple Towel Holder.....	64
Big-Apple Candles.....	64
Handy Table Grill.....	64
Folding Clothes Rack.....	64
Self-Sharpening Mincer.....	65
Slices Meat in the Can.....	65
Dripless Pitcher.....	65
Mittens Have Scouring Pads.....	65
Novel Egg Cooker.....	65
Combination Beverage Tray.....	65
Portable Electric Ironer.....	65
Coffee Brewed to Taste.....	65

## NEW PROCESSES AND INVENTIONS

Conveniences Built into Bed.....	32
Air Cleaner Removes Dust.....	32
Device Labels Sausages.....	32
Fog Signals Control Trains.....	34
Portable Sun-Bathing Tent.....	35
Novel X-Ray Projector.....	40
New Ultra-Violet Lamp.....	40
Kit for Making Clock.....	42
Coats Pipe with Concrete.....	42
Pocket Computer for Light Cost	42
Card Keeps Golf Score.....	42
Foot Warmer Fits under Table....	43

Glove Ends Thumb-Sucking.....	50
Skate Wheels Fit Sled.....	50
Cut-Outs Dress Up Easter Eggs....	51
"Gun" Reveals Fingerprints.....	51
Prints Tickets to Order.....	52
Odd Furnace Melts Metals.....	52
Nail File and Clip Combined....	53
Miniature Ice-Hockey Game.....	53
Now You Can Chew Coffee.....	53
Invents Silk-Reeling Machine....	56
New Solitaire Bridge Game.....	56
Folding Drier for Fishline.....	56
Portable Pump Disinfects Water	58
Speedboat Lands War Tanks.....	61
Flash Lamp Lights Maps.....	61
Novel Metal-Cutting Tool.....	61

## PHOTOGRAPHY

Portable Photo Darkroom.....	53
High-Speed Lightning Photos.....	58
Handy Photo-Enlarging Mask.....	58
Making Ground-Glass Screens....	101
Checking Camera Sunshades.....	111
Homemade Enlarging Easel.....	112
Waxing Ferrotypes Plates.....	112

## UNUSUAL FACTS AND IDEAS

Batting Machine Tests Balls.....	32
Test Strength of Cartons.....	34
Odd Oil-Well Explosion.....	35
Patients Give Selves Gas.....	35
Hobbyist Starts Beach Museum....	40
Tests Made with Living Heart.....	41
Coiled Wire Traps War Tanks.....	41
Piano Has Transparent Case.....	41
Sun's Heat Makes Fuel Gas.....	50
Kisses Now Telegraphed.....	53
Unrelated "Twins" Just Alike.....	56
Engraves Pictures on Fungus.....	59
Postage-Stamp Jewelry.....	59
Tests Tenderness of Peas.....	59
Milk Spray Aids Sun Tan.....	60
"Peanut Whistle" Kills Germs.....	60
Work Gauged in Bread Slices.....	61

## WOODWORKING

Easily Built Hutch Table.....	68
Unique Wood-Turning Method....	71
Finishing Our Sectional Boat.....	80
Home Workshop Blueprints.....	104

## IDEAS FOR THE HANDY MAN

Flashing Lighthouse for Garden	67
Three-Legged Sawhorses.....	70
Shoe-Shining Bracket.....	70
Chip Rack Holds Hardware.....	70
Power Take-Off Drive.....	70
Glass Protects Window Sill.....	70
Combination Screen Door.....	72
Blackboard Behind Bench.....	72
Handy Holder for Pencil.....	72
Attic Ventilating Fan.....	73
Cutter Slits Wrapping Paper.....	73
Brooches from Sheet Copper.....	76
Decorating a Fish Bowl.....	76
Novel "Saturn" Radio Lamp.....	77
Coat Rack for Boy.....	77
Homeworkshop Guild News.....	78
Snakes Braided from Leather.....	79
New Game Flips Disk.....	82
Caster-Cup Telescope Mirror.....	82
Making Durable Plant Labels....	82
Clamp Serves as a Wrench.....	82
Choosing a Paint Sprayer.....	84
Attachments for Cutting Torch....	86
Making Measurements Unaided....	86
Dummy Padlock on Gate.....	95
Inexpensive Trailer Axle.....	95
Reflector on Mail Box.....	95
Ice Shaver Removes Molding.....	95
Fiber Guard for Wiring.....	95
Boring Rubber Stoppers.....	97
Small Armature Tester.....	100
Heating a Square Tent.....	102
Fixing Dull Pencil Pointers.....	105
Hammer Handle Stays Tight.....	105
Making Screen Door Fit.....	106
Chisel-Grinding Guide.....	113



# THE BIGGEST TELEPHONE VALUE FOR YOUR MONEY



Nowhere in the world do people get so much for their telephone money as in America. No other people get so much service and such good service at such low cost.

**BELL TELEPHONE SYSTEM**





# Our Readers Say



## When Is a Straight Line Not a Straight Line?

ANYONE interested in optical illusions can find an inadvertent but particularly striking one in an illustration that appeared in your April issue, on page 73 of the Home-Workshop Department, under the title, "Cutting Wooden Arcs with Little Waste." Look at the solid line, in the lower view, that separates sections A and B. It is a straight line, but you simply won't believe it until you place a ruler alongside of it! The three curved, dotted lines near-by make the straight one appear to be bowed the other way. What's more, the whole wooden piece shown in the lower view seems warped like part of a hoop, whereas the curvature actually lies all in one plane.—R. G., Rutherford, N. J.

COCKEYED? NAW,  
JUST AN OPTICAL  
ILLUSION!



## Perhaps It Proves That You Shouldn't Play Poker

FEELING that extrasensory perception (telepathy to you) would come in handy if you could use it to read somebody else's poker hand, I've been trying out some of Dr. Rhine's experiments with his fancy pack of twenty-five cards marked with circles, wavy lines, and so on. To my dismay, I find that my scores at "calling" the cards while some one else looks at them are not only no better than might be expected by pure chance, but actually, after repeated trials, are subnormal! Now, what does that prove?—P.H., Atlanta, Ga.

## Reader Wonders How Spent a Spent Bullet Really Is

HAVING a practical problem which has puzzled me for a long time, I finally decided that writing to you would be the best way of solving it. Here it is. I do a good deal of target practice in the country. It consists largely of throwing tin cans into the air and trying to hit them. What I want to know is this: At what angle from the horizontal is it safe to shoot upwards so that the bullet will fall dead and not do any harm if it lands on some one. Theoretically, the bullet would have the same power as when it left the gun, if it were not for air resistance. Would this cut down the power enough to make the bullet land harmlessly, provided it is fired at or above a given angle, and, I repeat, what is this angle? I use a .22 caliber short, which the advertisements tell me has a muzzle velocity of 1,142 feet a second, dropping to 904 feet a second at 100 yards. I'm sure some one can answer this.—L. W. D., Elmhurst, Ill.

THIS BELONGS TO  
THE GUN BUGS  
IN OUTDOOR LIFE!



## It's Just a Matter of Dollars and Sense

YOU MAY claim that this problem has more than one solution. If you think so, then try to find one, which I assure you exists. A man had three married daughters, Mrs. Jones, Mrs. Smith, and Mrs. White. Each had one child. When the old man died, his fortune was distributed according to his will among his daughters, sons-in-law, and grandchildren as follows: Each of the nine persons received a number of envelopes (a different number for each), each envelope containing a number of dollars equal to the number of envelopes which that person received. The share of money for each woman exceeded her husband's share by the same amount as her husband's exceeded her child's. No two families received the same amount of money, but all three families received the same number of envelopes. The number of envelopes received by Mrs. Jones and Mrs. Smith together equaled the number received by Mrs. White and Mr. Jones. All nine persons were penniless before the bequests. Afterward, all were wealthy, but none was a millionaire. What were the nine sums of money distributed by the will?—C.T., Antigonish, Canada.

## Wants Range-Finder Plans for Small Boats

BEING a boat owner as well as a radio fan, I'd like to make a suggestion for an article. How about giving us simplified plans for a portable, self-contained radio direction finder that can be used on a small boat? Boat owners all over the world have need for such a circuit. The practical advantages of a water-tight cabinet for the set are quite obvious, so will you include specifications for this, too?—W.I.N., Saugus, Mass.

I'D RATHER LISTEN TO  
JACK BENNY!



## Inventor of Automatic 'Chute Jumps onto a Critic

LIKE R.A.D., Omaha, Nebr., I am fond of gadgets and for that reason am an old subscriber to your interesting and instructive magazine. Also, I happen to be the inventor of the automatic parachute described in your February issue and commented on by R.A.D. in "Our Readers Say" for March. So he would be afraid to use my automatic 'chute for fear a mechanic might have left out a gear? Well, our timid friend has the wrong conception of the way my 'chute works. He would not be called upon to hold the "little wind vane." That takes care of itself. All he would have to do is to jump and forget all about the little wind vane. His speed through the air would do the rest. In fact, if he should happen to swoon before jumping time and some

one thoughtfully tossed him out of the ship, the automatic 'chute would function and let him down, gently but firmly.—H. A. Burgess, Los Angeles, Calif.

## This Will Set Your Head Spinning in Circles

THAT problem about the compressed spheres furnishes a lot of food for thought for the delvers into the abstract. It reminded me of one of my own inventions, which I hereby pass along for the mathematically minded. Given a number of pennies or other circles of equal size, what is the greatest number of them that can be laid around a single one, so all the outer circles touch the central one? Can you prove it?—A.H.S., Allentown, Pa.



## He Just Rivets His Attention on Photography Hints

How anyone with the intelligence to read and appreciate P.S.M. can waste valuable hours turning old film spools into washers and rivets, as does H.S.M., according to his letter in "Readers Say," is more than I can fathom! Time down in Maine must be worth all of six thousandths of a cent an hour at that rate, because you can buy a whole bag of assorted rivets and washers from any mail-order house for about twenty cents. Well, every man to his tastes, and my taste is to keep up with photography hints and methods.—C.W.C., Rochester, N.Y.

## That's a Fancy Name for a Compressed Soap Bubble

W.E.M. ASKED what shape soap bubbles—which may be considered as perfect spheres—would take if crowded together in a small space in such a way that all the spaces between them would be taken up. This has been calculated mathematically, though I do not know the method used. But I have studied this shape in connection with histology, the science of the structure of minute organic tissues. Since living cells may be considered as essentially spherical in shape, they would react the same as soap bubbles under the conditions being considered. It has been found that cells packed in layers without greatly unequal pressures assume an orthic-tetrahedraicahedronal shape, which has fourteen sides, or facets. Eight of these facets have four edges, the rest six edges. It is interesting to note that this shape gives the cells the max- (Continued on page 7)

S'MORE FUN LOOKING  
AT BUBBLES IN A BEER  
BOTTLE!





(Continued from page 6)

imum of traction with each other and, at the same time, the minimum number of angles and sides. If they were cubic, they would tend to slide over one another. W.E.M. may be able to demonstrate this effect by shaking some soapy water in a bottle and observing the bubbles of the lather.—R.L.M., Palo Alto, Calif.

### Imagine Ordering Dinner from Your Coal Dealer!

DON'T the people of Germany process coal into an edible food? If so, why don't the people of the United States do likewise? Coal is composed of decayed vegetable matter; in other words, condensed vegetable matter or condensed carbon. Coal is carbon, and carbon contains heat. Couldn't the scientists of America figure out some way to put this coal into capsules for an edible food?

SAY, COAL COSTS ENOUGH NOW!



Or, maybe the coal, if eaten moderately, is all right without being processed. My theory is based on the proposition that the essential value of food is heat—to heat the human body. If my theory is correct, Americans are wasting a lot of coal food by burning it up in stoves and furnaces instead of in their own bodies. Coal may taste a little bitter, but most all bitter foods are good for the human body. I believe that the human body could adapt itself in a short time to the chemical process of converting coal into heat energy in a way similar to the heat-converting process of coal by oxidation or combustion. Some people have used coal, in small quantities, as a stomach medicine. Pigs can eat coal without any apparent harm, unless allowed to eat too much of it. If man could solve the food problem, think how far science could advance when man could apply his intelligence without worrying about food.—A.F.S., Princeton, Ind.

### You Can't Build a Subigible or a Dirmarine

YOUR timely articles on the submarine and the dirigible in the April issue made me wonder if it was accident or design that made you run them together. I had never realized until I read them how similar the two types of craft are. Their similarity of lines is obvious. Less obvious, however, are the following facts: Both weigh approximately the same as the operating mediums they displace. Both are driven by screw propellers revolving in those mediums, and are maneuvered by variation of their weight and by movement of their exterior controlling planes or surfaces. Both are affected by temperature changes of the mediums in which they operate, and both depend almost entirely on some kind of special supply base. Both were invented for purposes of war, and both have been converted to peacetime use. Both are

KIPLING SAID IT, A SUB'S A SUB AND A DIRIGIBLE IS A D'RIGIBLE AND AINT NEVER GONNA MEET!



(Continued on page 8)

## The Case of a DELCO BATTERY



DIELECTRIC TEST

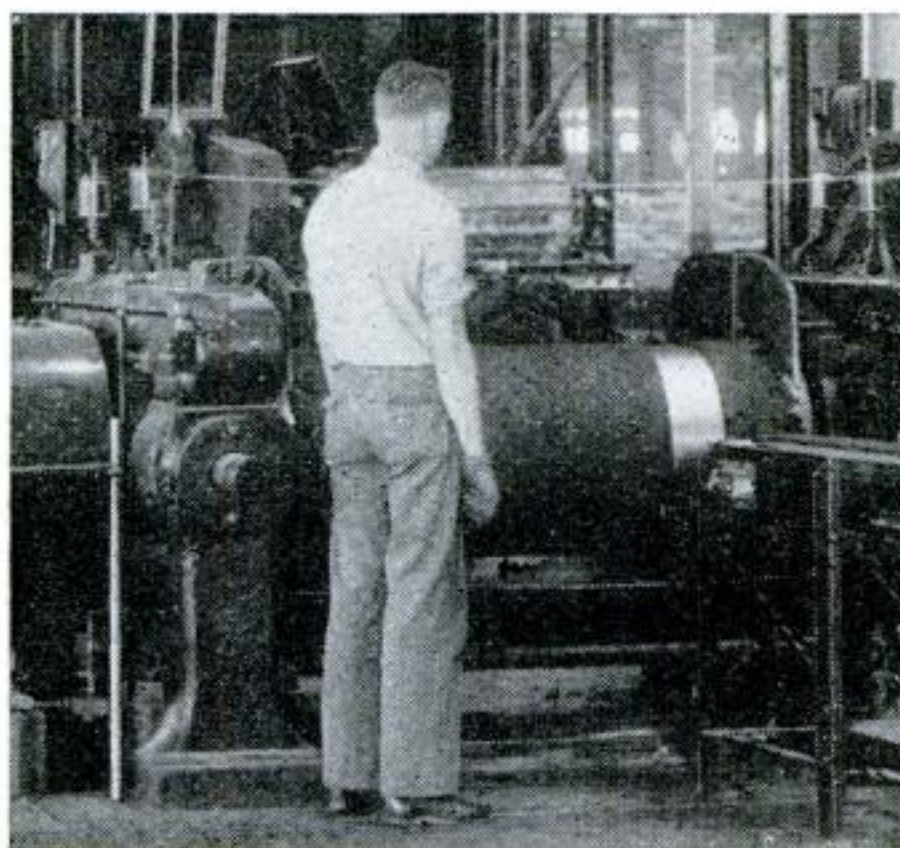
All Delco battery cases are made of genuine hard rubber in Delco-Remy's battery case plant. Every step in their production reveals the extreme care Delco-Remy takes to assure the *best* in battery construction. Consider a few of these steps:

The rubber "mix" is thoroughly kneaded for extra strength and resiliency.

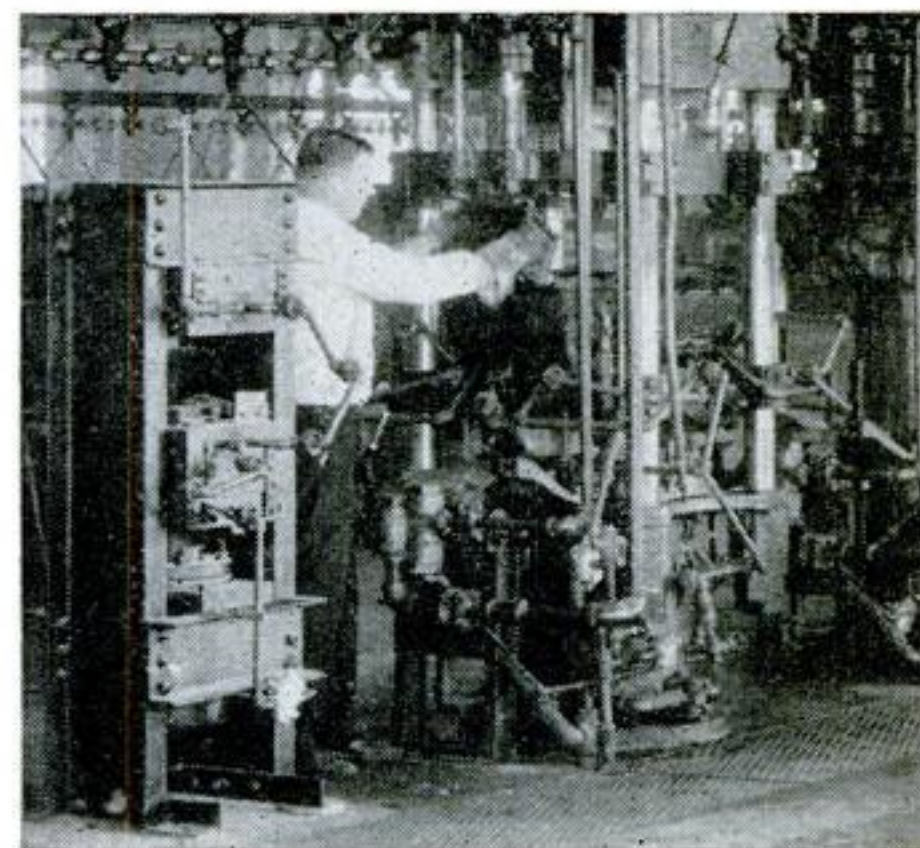
All rubber is carefully weighed before being molded into the case, to assure the correct amount.

Each case is molded under carefully controlled heat conditions and cooled naturally over a form, to retain its exact dimensions.

Every case and every cell-to-cell partition receives a "dielectric" test of 24,000 volts, which will reveal the slightest defect.



RUBBER MILL



CASE MOLDING

It is this unwavering adherence to high standards in materials, construction and performance that has made Delco batteries original equipment in many leading motor cars, including all General Motors cars.

Delco battery sales and service requirements are available at United Motors Service Stations.



# Delco-Remy

ANDERSON, INDIANA

World's Largest Manufacturer of Automotive Electrical Equipment



# OLD KING COLE WAS A SOUR OLD SOUL!



**HE CALLED FOR HIS PIPE**—and in it came. But nix on that stuff about "a king can do no wrong"! His Majesty smoked a stinko mixture *none* of his court could stand!



**IT KNOCKED 'EM OUT.** Every lord and lady went down—kerplunk! Except the jester. He could take it! He could dish it out too! He ups and says to the sour old soul:



**"I'M A FOOL** about most things, but if you'll clean that pipe, and switch to mild Sir Walter Raleigh, you'll discover a *much* more fragrant blend of fine, ripe burleys."



**"IT DOES SMELL GOOD!"** cried the king, after he lit a pipeful of Sir Walter. "Have the cashier give this jester half my kingdom, and get me *another* two-ounce tin!"

*Switch to the brand of grand aroma*



**FREE BOOKLET** tells how to make your old pipe taste better, sweeter; how to break in a new pipe. Write for your copy today. Brown & Williamson Tobacco Corporation, Louisville, Kentucky. Dept. Y-85.

**HOW TO TAKE CARE of YOUR PIPE**

**TUNE IN** Tommy Dorsey and his orchestra. Every Wed., 8:30 P. M., E.S.T., NBC Red Network.

## Our Readers Say

(Continued from page 7)

highly vulnerable, and both depend on fuel to enable them to remain in absolute control. Yet neither could possibly be converted to the uses of the other.—D.F.T., Schenectady, N.Y.

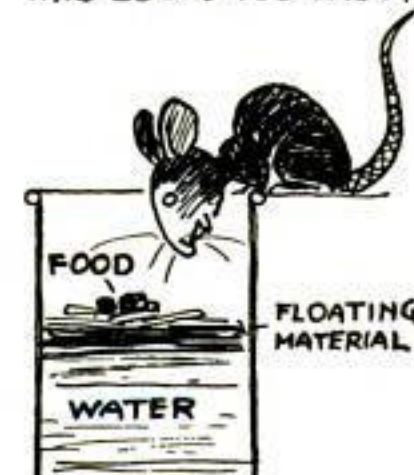
### —Or He Might Take Up Obstacle Racing

IF I had a team of horses or a farm tractor I probably would not be writing this letter. Lacking these and a basic knowledge of horticulture, I thought one of your readers might help me solve a problem. There is a snowball bush in my back yard right where I want to put a badminton court. The bush is about ten feet tall and presumably has a goodly set of deep-growing roots. To move it would mean cutting a much bigger chunk of soil than could be conveniently dragged, and yet to cut the roots would undoubtedly kill the bush. Nothing short of an earthquake seems to offer any solution to the problem. Can any one tell me whether I should trim the bush and roots to a convenient size for transplanting, or leave it alone and take up golf?—C.P.T., Montclair, N.J.

### A Simple Trap for Catching Rats

IN YOUR February issue, the article on "Man Vs. Rats" interested me very much, and I would like to tell you of my experience. I tried all kinds of poisons and traps with very little success. Then I remembered how we used to get them on the farm. A bucket half full of water is placed beside a box of about the same height to serve as a platform. Straw, cork, or other floating material is then placed on the surface of the water. Scraps of fatty meat are dropped in as bait, which lies on top of the floating material. Place the box and the bucket side by side. The rodent smells the bait, jumps up on the box, drops into the bucket for a meal and—good-by Mr. Rat. I drowned eleven rats in one night with this method, which is cheap and therefore worth trying. Perhaps others will be interested.—C.F., Alexandria Bay, N.Y.

THIS LOOKS TOO EASY!



### Article on One-Piece Rails Was Clear to Him

REGARDING the question raised by M.A.L., of East Orange, N.J., about how the one-piece rails are put down on a roadbed where no track existed before, I interpreted the article in the February issue to mean that the train rode over the newly laid tracks. At least one of the pictures shows the engine pushing the train ahead of it. From the cars which go first, the rails can be removed and laid on the roadbed to provide tracks for the on-coming train. As a matter of fact, the text says quite plainly that "As the final step, any desired number of these sections are fused together with thermit or chemical welds during the operation

(Continued on page 9)



(Continued from page 8)

of laying them." That's clear enough for me.—C.B.A., Esterly, Pa.

### Reader Gives a Big Hand to the Little Improvements

RUMMAGING through my attic the other day, I came across an old electric plug of porcelain. The thing looked so antiquated that it started me thinking. Do many of us realize how radically styles have been changing, during the last few decades, in all the little things that touch our daily lives—or are they overshadowed by the big inventions such as radio, airplanes, and automobiles? It might be fun to get together a museum exhibit of modern appurtenances of everyday life and the old-fashioned things they replace. I'd nominate: Gummed-paper tape for string, in wrapping packages. Screw caps for bottle corks. Slide fasteners for hooks and eyes or buttons. Beer cans for bottles. Chromium for nickel and brass. And, of course, for paper and what have you, a certain well-known transparent material that practically everything but the Brooklyn Bridge has now been wrapped in. Any other suggestions?—P.H., New York City.

BET YOU CAN'T FIND A MODERN SUBSTITUTE FOR THE OLD COAT SPRING!



### He Probably Would Answer to Just "Hey!"

IN "The Man with the Net," in the December issue, there is an item saying that average boys have three nicknames. Well, what do you think of this? I have nine nicknames. They are Peanuts, Shanghai, Pinochles, Springy, Pygmy, Tor, Breezie, Vishy, and Fish.—V.J.V., Calgary, Alberta, Canada.

### These Traffic Lights Would Help You Start Stopping

AN OBJECTIONABLE feature of the two-color traffic-light systems is that motorists and pedestrians have no definite means of telling how soon such a system is going to make a change. Drivers don't know whether they will be able to "make" an intersection before the lights turn red. Many find out too late, with resultant jamming on of brakes and occasional fender clashing. My idea is to install master rheostats that would dim the green lights gradually on a thoroughfare, thus informing motorists of the coming change before it is too late. There would be less chance of a motorist losing track of the lights altogether as he does, for example, in a city like New York where, on some streets, traffic lights are definitely out between changes. Here, also, the motorist becomes confused by the many red storefront signs. Halted traffic would be allowed to start when the gradually brightening lights reached full intensity, which could be signified by means of a single stroke of a small bell.—A.V., New York City.

SO WHAT? WE TRIED AN AMBER LIGHT WITH RED AND GREEN!



# INVENTORS

## This FREE BOOK TELLS HOW

your Patent Application is made; what kind of sketches or drawings are necessary; what other papers must be made out; how the Patent Laws protect you; why it is important to avoid loss of time in getting your application filed; and many other important points. Even a very simple invention, if new and useful, may prove very valuable. You may have much to gain and nothing to lose by sending for this book TODAY.

### DELAYS ARE DANGEROUS IN PATENT MATTERS

The Free Book shown here was prepared for inventors, to show them exactly what steps they must take to secure a Patent. If you have an invention, you should send for this book AT ONCE. Without a U. S. Patent, you cannot reap the profits that your invention may make possible. Send at once for this book.

### MODELS AND FINISHED DRAWINGS UNNECESSARY

Don't spend money or time on finished models or drawings before you know your invention may be patentable. Our large staff of experienced patent searchers can handle a search from your description and roughest sketch. The main thing is to put it in our hands as promptly as possible.

### THE FIRST STEP . . .

When you place your invention in our hands, we are in position to proceed at once to secure protection for you. Our fees are reasonable, and, if you desire, we can arrange convenient terms of payment.

Mail Coupon TO-DAY

### FACTS ABOUT OUR SERVICE

We are Registered U. S. Patent and Trade-Mark Attorneys, serving inventors all over the United States. Our organization is complete in every particular. We have Draughtsmen, experienced Searchers, and Attorneys to serve your interests. We have had years of experience in patent matters and know every angle of legal approach. We will secure protection for your invention if it can be done! But the longer you delay the harder it may be for us to serve you.

## CLARENCE A. O'BRIEN and HYMAN BERMAN

88-Y Adams Building, Washington, D. C.

Registered Patent Attorneys  
Before U. S. Patent Office

Please send me at once your Big Free 48-Page Book, "Patent Guide for the Inventor" and your specially prepared "Record of Invention" form. This request does not obligate me.

Name .....

Address .....  
(Please write or print plainly)

### FREE RECORD OF INVENTION FORM

If you prefer to use a form made specially for the purpose of recording the descriptive outline of your invention for our searchers' use at the U. S. Patent Office, write today for our Record of Invention form—it will guide and assist you. It enables you to make a sketch of your invention and have it witnessed in a manner of value to you as evidence should the occasion for evidence arise. Our FREE BOOK tells you how to use this form to protect your interests.



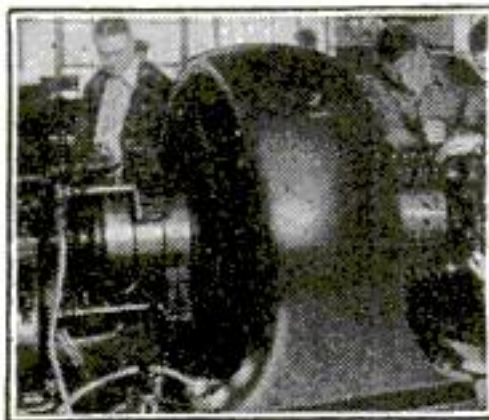


# Secrets of Success

STORIES THAT WILL HELP YOU GET AHEAD



Here in  
**CHICAGO**  
in the famous  
**COYNE**  
TRAINING SHOPS  
YOU CAN  
**TRAIN FOR**



**ELECTRICITY** IN 12 WEEKS  
BY ACTUAL WORK ON MOTORS, GENERATORS, ENGINES ETC.  
**PAY TUITION AFTER GRADUATION**

You don't need advanced education or previous experience. Don't let shortage of cash hold you back. Send coupon today for all details of this offer. We will train you in the Coyne Shops and then give you over one year to pay your Tuition AFTER you graduate.

**EARN LIVING EXPENSES WHILE TRAINING**  
**JOB HELP AFTER YOU GRADUATE**

You train on modern Motors, Generators, Dynamos and other electrical equipment. Many do part time work to help earn living expenses. After you graduate my Employment Service gives you valuable Job help throughout your life.

**Training in DIESEL, Electric Refrigeration and Air Conditioning—NO EXTRA COST**

**SEND COUPON FOR FULL DETAILS**

H. C. Lewis, President,  
**COYNE ELECTRICAL & RADIO SCHOOL**  
500 S. Paulina St., Dept. 58-73, Chicago, Ill.  
Send me your Big Free Book. Give me all details regarding "Pay After Graduation" Plan and training in Diesel, Electrical Refrigeration and Air Conditioning.  
NAME.....  
ADDRESS.....  
CITY.....STATE.....



**High School at Home**

**Many Finish in 2 Years**  
Go as rapidly as your time and abilities permit. Equivalent to resident school work—prepares for entrance to college. Standard H. S. texts supplied. Diploma awarded. Credit for H. S. subjects already completed. Single subjects if desired. Bulletin on request.

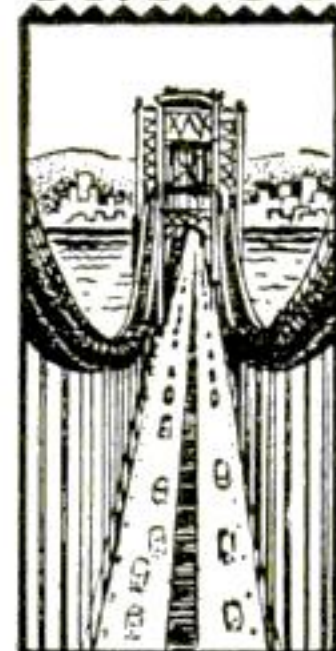
**20 Other Courses**  
Specialized training is absolutely essential to Success today. Over 150 noted Educators, Engineers and Business Men helped prepare our special instruction material, used by many resident schools and colleges, U. S. Navy and Province of Manitoba, Can. Train at home for best-paying lines as listed below. No interference with present earnings while preparing for better job.  
**American School, Chicago**

**Mail Coupon for Information—No Obligation**

American School, Dept. H-546, Drexel at 58th, Chicago  
Tell me how to train for success in line checked.  
☐ High School Course in 2 Years  
☐ Air Conditioning  
☐ Architecture and Building  
☐ Automotive Engineering  
☐ Aviation  
☐ Business Management  
☐ Civil Engineering  
☐ Complete Law  
☐ Diesel Engineering  
☐ Drafting and Design  
☐ Electrical Engineering  
☐ Electrical Refrigeration  
☐ Highway Engineering  
☐ Liberal Arts (College)  
☐ Mechanical Engineering  
☐ Private Secretary  
☐ Professional Accounting  
☐ Incl. C. P. A. Coaching  
☐ Radio and Television  
☐ Salesmanship  
☐ Steam Engineering

Name.....  
Address.....

**TRI-STATE COLLEGE**



**SCHOOL OF ENGINEERING**

**Degree in 2 Years**

B. S. Degree in Civil, Electrical, Mechanical, Chemical, Radio, Aeronautical Engineering, Business Administration and Accounting. World famous for technical two-year courses. Also short diploma courses in Surveying (36 weeks), Drafting (36 weeks). Non-essentials eliminated. Tuition and living costs low. For ambitious, earnest students. Those who lack high school training may make up required work. Students from all parts of the world. 55th year. Graduates successful. Enter June, September, January, March. Write for catalog. 553 College Ave., Angola, Ind.

## ENTERED NEW FIELD THROUGH HOME STUDY

THERE was no high school in my boyhood home town, and no money in our home to send me to the high schools of our nearest large city, St. Louis. Even as an "eighth-grader" I was fond of writing. However, when an opportunity came to attend a private manual-training school on a scholarship, I accepted it. Logically, upon completion of the four-year course, I entered the field of engineering, as a draftsman.

For seven years I worked for various industrial firms at the one type of work for which I was trained. It required only one or two of those years to convince me that I would never be happy as an engineer. Constantly, my thoughts were about writing—particularly the writing of advertising, mercenary chap that I was. Some day, when I managed to save a bit of money, I would take a college or a correspondence course. But there were always home responsibilities, and the savings just never seemed to accumulate.

In the meantime I married a successful business girl. To her I confided, in time, that I was unhappy as a draftsman and shop-production man. "Some-day," I told her, "I'm going to take a correspondence course (I had given up the college idea by then) in advertising." "Fine," she replied. "Why not enroll when you go down town tomorrow?"

I looked aghast. My income was barely enough to pay the rent and buy food. But wives can be determined—and can possess enough faith to compensate for the lack of determination in a fearful spouse. I enrolled in the advertising course of the ——— School, on the deferred-payment plan involving the smallest monthly payments. Without formal enrollment, I also began the home study of typing, with my wife as most competent instructor.

Within nine months I had reached the halfway mark in my course and decided to begin looking for a place to apply my new training—most thorough training, I may add. Through the local ———

School office, I learned that the advertising manager of the ———

Co. required an assistant. I applied and was employed. My ———

School training was of immeasurable benefit in helping me carry on my work, but, needless to say, I did plenty of additional learning on the job. So excellent was my advertising grounding that five months later, when the advertising manager resigned, I was appointed his successor.

In the meantime I continued my course, finding ample opportunity to ap-

## PROFIT from DIESEL

52  
Bulletins on  
Diesel  
Engines



Sponsored  
by Diesel  
Users' Assn.  
of America

Packed with practical information, they will fit you to earn a steady living in this rapidly growing industry. They are based on years of experience of the leading operators and owners of Diesel engines. Invest profitably in Diesel training by becoming an Applicant Member of the Diesel Users' Association. Write for full information to Department A.

Diesel Users' Pub. Co., 2 West 45th St., New York

## Be a DENTICIAN

LEARN AT HOME

To make Crowns, Plates, Bridgework, etc., for Dentists. Easy practical way to learn mechanical dentistry at home in spare time. FULL EQUIPMENT OF TOOLS AND MATERIALS INCLUDED WITH COURSE. Low tuition. Easy terms. Write for FREE BOOK about this money making profession that is not affected by machine age.



McCarrie School of Mechanical Dentistry  
207 N. Broad St. Dept. 657 Philadelphia, Pa.

## ELECTRICAL ENGINEERING ONE YEAR CONDENSED COURSE

Prepares for technical work in the electrical field. Thorough training in principles, with practical applications in laboratory and shop. High placement record. Modern buildings, dormitory, dining hall. Campus. 46th year. Catalog.



**BLISS ELECTRICAL SCHOOL**

105 Takoma Avenue Washington, D. C.

## HOW TO MAKE MONEY

Thousands of publications buy MILLIONS of photos from free-lance camera owners every year. We show you what to photograph, how to do it, where to sell for biggest profits. Learn at home, in spare time. Pay for course in easy monthly installments. No special camera needed. Write for FREE BOOK telling about this fascinating new field. **UNIVERSAL PHOTOGRAPHERS, Inc., Dept. 35, 10 West 33rd Street, New York City.**

**WITH YOUR CAMERA**

## BIG MONEY from POULTRY

I show you how to greatly increase profits, start your own business, or secure a good job in a big poultry plant. I train you at home in spare time quickly. Show you very latest methods. Give you facts worth money to yourself or employer. My home-study course used by thousands. 32-page book, "How to Raise Poultry for Profit" comes to you FREE. Write today: **HARRY M. LAMON, Pres., National Poultry Institute, Dept. 209-B, Adams Center, N. Y.**

## Get BIG PAY for YOUR Time

YOU SELL TO Demonstrating and Taking Orders for this  
Engineers, Mechanics, Sheet Metal Workers, Garage Men, Etc.  
**Justrite COMBINATION SOLDERING IRON AND BLOW TORCH**



**Amazing Invention!** Marvelous COMBINATION Soldering Iron and Blow Torch gives super, sizzling-hot blue-white flame automatically! NO stove, NO charcoal, NO pumps, NO electricity! Operates with 100% satisfaction, on less than 1/4 cent per hour. Guaranteed by famous 31-year old company. **FREE:** New sensational "Distributors' Success Plan," to Distributors of this Amazing Tool. No experience required. Write for Complete Information TODAY.

Justrite Mfg. Co., Dept. 145, 2061-81 Southport, Ave., Chicago, Ill.



## Secrets of Success

ply the training. Then came the depression of 1920. The company decided to discontinue advertising—and the services of the entire advertising department. Now came the crucial test of my training. Could I apply advertising to secure a new connection? I could. Within two weeks I was a member of the copy staff of the ——— Advertising Agency at increased salary—the result, primarily, of a sales-letter campaign.

Sometimes my days were busy, and for weeks my uncompleted course lay on my table. Ultimately, however, I completed it. Several years later I received an invitation to join the advertising department of the ——— Co. Thanks to the comprehensive course prepared by ——— School, I was able successfully to handle a myriad of problems covering almost every phase of advertising—direct-mail, farm-paper advertising, outdoor advertising, newspaper advertising, and so on.

I became particularly interested in dealer merchandising. Feeling the need of more training along this line, I took the ——— School course in merchandising, which has been tremendously helpful ever since.

So far I have said nothing about income, because that has meant less to me than the fact that I have been extremely happy in my work. However, my income has been well above average—and still is. Of greatest personal satisfaction is the fact that I have "made good" in every advertising position I have held, and have been able to gratify my desire to write. Not only have I written reams and reams of copy, but also hundreds of trade-paper articles, and several books on merchandising.

Once upon a time it was quite customary to ridicule the idea of correspondence courses. But those who laughed had never taken such a course. I have proved, personally, that the last laugh belongs to those conscientious individuals who really put time and effort into home-study courses, for they are bound to get profit and pleasure out of them.—F. H. M., *Elmhurst, N. Y.*

## DRAFTSMANSHIP GOAL SEEMED HOPELESS

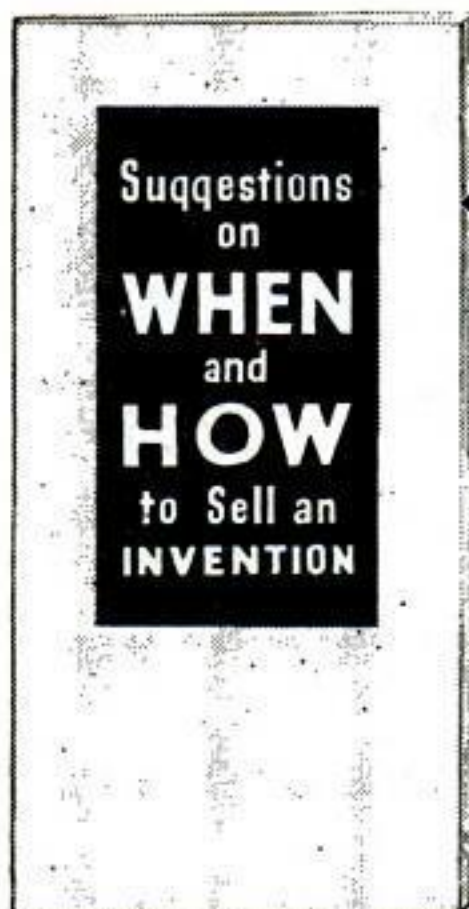
I CANNOT overestimate the benefits received from studying mechanical drafting with the ——— School. I left high school at the tender age of seventeen, because it didn't appeal to me. I wanted to find work in the mechanical field. Unfortunately, there were no positions available in that field, so I accepted a position as a glass grinder with the ——— Co. After working there for about a year, a fellow employee informed me that the owner of the ——— Garage wanted a young man with mechanical ability to work in his establishment.

That same evening, I inquired about the position, obtained it, and a week later left my old position for the new work. This job held my interest for a

# VALUABLE BOOKS FREE TO INVENTORS AND OTHER MEN WITH IDEAS

## THIS BOOK Tells How To Protect an Invention

**T**ELLS you exactly how the Patent Laws protect you. Why you need a Patent at all. Explains simple but important steps to take at once without cost to help establish your claim to your invention. Explains what kind of sketch, drawing or model is needed, the preliminary search, how Patent papers are prepared, assignments in return for financial assistance, etc. Also illustrates many interesting inventions, shows you 115 different mechanical movements that inventors have used in working out ideas, and much more. Inventors the world over have welcomed this book. We gladly send it with our compliments to any serious, interested man.



## THIS BOOK Tells How to Go About Selling an Invention

Tells you how in an inexpensive manner you can bring your invention to the attention of prospective buyers. Suggests the proper time to take such step. Outlines methods other inventors have used successfully in selling and marketing. Remember, an invention isn't enough. A Patent isn't enough. You must also know how to cash in. This book deals with that subject. Also sent to you free and without slightest obligation. Mailed the same day we hear from you.

## What is an Invention?

Many people have the impression that an invention must be something radically new or complex. Nothing is farther from the truth. Most successful inventions of today are improvements on devices which have already been thought of before and many of which have been on the market for years. Whether your invention, or your idea for one, is something radically new or merely a sensible improvement on an existing article does not matter. If it will save time, save labor, make money or give pleasure, you should at least see about the possibility of protecting it.

## 40 Years in the Business of Helping Inventors

For 40 years—more than a third of a century—it has been our business to help inventors. We have represented thousands of them from all over the world in their dealings with the United States Patent Office. We answer questions. We study each device to bring out its best patentable possibilities. Also, we frequently advise inventors against going ahead with inventions which could not possibly have been protected. By carefully developed methods, we try to keep expense at a minimum, and arrange deferred payments when needed. The booklets shown above may be the means of saving you time, trouble, expense and even later disappointment. They are yours for the asking. Write us today.

## Strictest Secrecy— Write us in Confidence

With the booklets we will also send you a free copy of our "Evidence of Invention" form, on which you can sketch and describe your invention and establish a date of disclosure. Such a dated disclosure may later prove important to you. We send full instructions. Any letters, sketches, drawings or models which you entrust to us are held in strictest secrecy. You may write us fully and frankly. But first, **KNOW THE FACTS.** Sign and send the coupon now. Get that much done today.

**VICTOR J.  
EVANS & Co.**  
REGISTERED PATENT ATTORNEYS

Main Office: 10-E, Victor Building, Washington, D. C.

OTHER OFFICES: 2610-C, Singer Bldg., NEW YORK; 1445-C, Monadnock Bldg., CHICAGO; 1010-C, Hobart Bldg., SAN FRANCISCO; 405-C, Garfield Bldg., LOS ANGELES

Send me FREE copies of your books, "Patent Protection" and "When and How to Sell an Invention." (Note: Same books supplied by any of branch offices listed above.)

Name .....

Street and No. ....

City or Town.....State.....

Mail this to  
Washington, D.C.  
today!





I can train you for  
**DRAFTING**  
right in your home  
by my practical method

Engineer Dobe can prepare you just as he has trained thousands of successful students, aged 16 to 18 to past 50. His practical "Work-Job" method requires no previous experience. High school education not needed. He offers you a real opportunity to get a complete training in drafting right in your home in a surprisingly few months. Engineer Dobe teaches his students until thoroughly trained and until holding a good paying job. Drafting offers big opportunities in many fields. Mail the coupon today for FREE illustrated book "Successful Draftsmanship" and full details of Engineer Dobe's remarkable offer that includes all necessary tools and equipment. Send coupon TODAY!



Complete  
Outfit  
Furn-  
ished

Send for **FREE BOOK**

**ENGINEER DOBE**  
Div. 3395  
Libertyville, Ill.

Send me your free book "Successful Draftsmanship." Please explain how you assist your graduates to good positions as draftsmen.

Name \_\_\_\_\_  
Address \_\_\_\_\_  
Town \_\_\_\_\_  
State \_\_\_\_\_ Age \_\_\_\_\_

**MEMO—DO TODAY**  
Get dope on DIESEL, AIR  
CONDITIONING, or AIRCRAFT  
opportunities from V - S

**THE AIM** of Vocational Service is to aid men in selecting their fields of greatest opportunity, no matter where they live, and to help certain technical institutions find the right type of men for their training programs.

BOSTON, 902 Statler Building; NEW YORK, 420 Lexington Avenue; DETROIT, 2411 Fourteenth Street, CHICAGO, 228 North La Salle Street; MEMPHIS, 3rd and Madison Streets; LOS ANGELES, 3455 Eagle Rock Boulevard; SEATTLE, 2nd Avenue at Madison; VANCOUVER, B. C., Cambie and Hastings Streets.

**Vocational Service, Dept. S-5** (addresses above)  
Please send booklet describing field checked below, and how I may qualify for it—without obligation.

☐ DIESEL ☐ AIR CONDITIONING ☐ AIRCRAFT

Name \_\_\_\_\_ Age \_\_\_\_\_

Street \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_

When Writing Advertisers  
Please Mention **POPULAR SCIENCE**

**WORK FOR THE**  
**RAILWAY POSTAL CLERKS**  
**CLERKS**  
**CITY CARRIERS**  
**GOVERNMENT**  
**\$1260 to \$2100 Year**  
**TO START**

42,766 Appointments  
1937 Gov't year.

Many expected  
in 1938

Common educa-  
tion usually  
sufficient

Mail Coupon  
Today—  
**SURE**

**COUPON**  
Name \_\_\_\_\_  
Address \_\_\_\_\_  
**FRANKLIN INSTITUTE**  
Dept. P243  
Rochester, N. Y.  
Rush FREE list of U. S. Gov-  
ernment big pay JOBS. 32-page  
book describing salaries, hours,  
work. Tell me how to qualify for  
one of these jobs.

## Secrets of Success

short time, but soon the long hours at strenuous and greasy work made it monotonous.

At this time, I met a man who was a draftsman with the ——— Airplane Corp. After I told him about the unfavorable working conditions in the garage, he helped me to get work as an apprentice machinist in the airplane factory. I was coming along very well, but contacts with my friend made me change my mind about becoming a machinist and set my heart on drafting.

Becoming a draftsman was considered a hopeless matter, due to my limited education, until I learned about the ——— School. After getting all the details from a representative of the school, I enrolled for a mechanical-drafting course. This was in December 1931.

At the present time, I am employed as a tool draftsman with the ——— Corp., and am earning a good salary. The ——— School textbooks serve as ready reference in my everyday work. I am married and the father of a three-months-old baby girl. I am only twenty-five, and reside in one of the better sections of town.

I have not as yet completed my course, but expect to within the next year. Then, I anticipate enrolling for a course in mechanical engineering. As I look back over the hours I studied and think of the sacrifices made to acquire this specialized training, they fade to insignificance in comparison with the benefits I received.—S. R., Bethpage, N.Y.

## HER KINDERGARTEN BROUGHT HAPPINESS

TIME on my hands! A worried look in my husband's eyes! Leisure for me! My husband rushing frantically to work every morning, returning home nearly exhausted every night! There was something wrong about the situation.

Do something! Now! Help him meet those bills, instead of sitting around manicuring your finger nails.

I did do something. I took the correspondence course in modern kindergarten training at the ——— School.

How I studied those lessons! All through the winter I struggled with positive methods of presentations, mental-ability tests, how to give children a comprehension of social responsibility, and development of ideals through stories.

The course was thorough. No doubts lurked in my mind after I had finished. I knew how to begin and how to "carry on." When I received my diploma, I rolled up my sleeves and gathered nearly every little tot I could find into my home to give them the benefit of the knowledge I had obtained. Forty-two children of preschool age enrolled. They pushed us out of our home. A beautiful stone church, which the town had bought for a library, but which was not to be occupied for a year or

**GIVE ME 7 DAYS TO PROVE I CAN MAKE YOU A NEW MAN—**

I changed myself from a 97-lb. weakling to winner of title, "World's Most Perfectly Developed Man." Let me prove—in 7 days—that my secret of **Dynamic Tension** will make a NEW MAN of YOU—give you glowing health, smashing strength—banish constipation, bad breath, pimples. Thousands praise my natural method. Write for FREE BOOK of actual photos. **CHARLES ATLAS**, Dept. 15, 115 E. 23rd St., N. Y. City.

**SEND FOR MY FREE BOOK**

## EARN THE DEGREE

Doctor of Psychology (Ps.D.). Philosophy, Theology, Science. General Courses—Arts, Law, Business, etc. "CHARTERED BY STATE OF MONTANA." Send for 32-page FREE Bulletin at once. No Obligation.

**TEMPLE BAR COLLEGE**  
(Dept. B), 213 East Main Street  
Missoula, Montana, U. S. A.

## Learn Photography at HOME

Splendid opportunities. Prepare quickly in spare time. Easy method. No previous experience necessary, common school education sufficient. Many earn while learning. Send for free booklet "Opportunities in Modern Photography", particulars and requirements.

**AMERICAN SCHOOL OF PHOTOGRAPHY**  
3601 Michigan Ave. Dept. 1365 Chicago, Illinois

## CHEAPER TENNIS

**EARN MONEY, TOO!**

NOW—you can buy Wills' fresh, genuine Eclipse SPLIT GUT tennis strings direct-from-factory for as little as \$2.25 PER SET postpaid. Also—excellent quality SILK at only 65c per 37 ft. coil, postpaid. Rush your order now! Satisfaction GUARANTEED. New 1938 CATALOG of Tennis Frames, Vises, equipment now ready. Get your FREE copy. Send today. **H. E. WILLS CO.**, Dept. 1365, 1047 W. 47th St., CHICAGO, U. S. A.

## BE A RAILWAY TRAFFIC INSPECTOR

Good Pay — and a Job with a Future  
Trained Railway and Bus Traffic Inspectors are in constant demand. Our graduates are placed in positions at up to \$135 per month, plus expenses to start, or we refund tuition. Rapid advancement for ambitious men, 19 to 50, who complete our easy, home-study course. Write for Free Booklet with Facts.

**STANDARD BUSINESS TRAINING INSTITUTE**  
Div. 305 Buffalo, N. Y.

## Government Jobs

Positions Clerk Carriers, Rural Carriers, Railway Postal Clerks, Postmasters, File Clerks, and many others. Splendid salaries, easy work, vacation with pay. Common school education sufficient. Examinations often. Established 1896. Send for our Civil Service Catalog.

**Columbian Correspondence College**

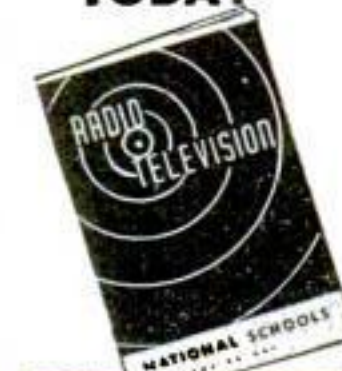
Washington, D. C.

## Learn Profitable Profession in 90 days at Home

Salaries of Men and Women in the fascinating profession of Swedish Massage run as high as \$40 to \$70 per week but many prefer to open their own offices. Large incomes from Doctors, hospitals, sanitariums and private patients come to those who qualify through our training. Reducing alone offers rich rewards for specialists. Write for Anatomy Charts and booklet —They're FREE.

**The College of Swedish Massage**  
1601 Warren Blvd., Dept. 570, Chicago  
(Successor to National College of Massage)

Send for  
your copy  
TODAY



## Do You Like RADIO

**TELEVISION, SOUND & ELECTRICITY**

You men who want to know the true facts about employment opportunities and requirements in radio and related industries should have National's new book—40 pages of information and illustrations.

**NATIONAL SCHOOLS**

**NATIONAL SCHOOLS**

Dept. PSR-5, 4000 So. Figueroa Street, Los Angeles, Calif.  
Please Send Free Book

NAME \_\_\_\_\_ AGE \_\_\_\_\_  
ADDRESS \_\_\_\_\_  
CITY \_\_\_\_\_ STATE \_\_\_\_\_



## Secrets of Success

two, was given to us to use. I had two assistants.

I did not know so many parents were yearning for kindergarten work for their children. In this town of 2,000, there was no kindergarten in connection with the public schools.

A dependable girl called for the children every morning with her car and delivered them safely home at noon. If you had passed near the kindergarten any morning, you would have heard eager little voices singing national anthems and southern folk songs. If you were tempted to enter, you would have watched them march to music every half hour to their next classes. I saw timid little ones develop initiative; too-bold ones become subdued. Every pupil was taught initiative, self-help, and recognition of the rights of others, during the early formative period.

Home study brought happiness to our home. The search for happiness is presumed to be the chief purpose of life. To many this may mean social success—to most it means healthy effort in daily work, with its resulting material success. For guidance received from this correspondence course, I am grateful. It led me to happiness and service.—Mrs. H. L., Seneca, Kans.

### More \$5 Prize Winners

THREE prize-winning letters in POPULAR SCIENCE MONTHLY'S Secrets of Success contest—"What Home Study Has Meant to Me"—are printed above. Read these stories carefully, because your own career may be just as interesting and inspiring to other readers. If you think so, put it down on paper and send it in. We will pay \$5 for every letter we publish.

#### CONTEST RULES

Only letters from bona fide home-study school students will be considered and these must contain the name of the school and the name of the company, or companies, for which you have worked since graduation. (Names, however, will be deleted from the letters when published.) We also want to know the kind of course you took and the type of position you have held. Your own identity will be kept anonymous, if desired.

We are interested in facts, not literary ability, but please write clearly, completely, and keep your letters within 750 words. We are not looking for "get-rich-quick" stories or freak adventures, and authors must be prepared to substantiate the truth of their statements. Manuscripts submitted and printed become the property of this magazine, and we are not responsible for the return of rejected letters unless sufficient postage is provided for this purpose. Address your contribution to Success Story, 353 Fourth Avenue, New York, N. Y.

# Are YOU a Business Coward?

—and—does it show in your pay-check?

"You've had your chance!" It was the General Manager speaking . . .

"Two years ago I warned you that the only man who could hope to get ahead in this organization was the man with training.

"Merwin was only a bookkeeper then, you remember, but in his spare time he was studying Higher Accountancy. I knew what he was doing, and I told you then to keep your eye on Merwin.

"He's had three raises since. He has more than doubled his salary—and he earns every dollar I pay him.

"Last week I recommended him for Assistant Treasurer, and the Board elected him without a dissenting vote. We're mighty glad to have him in the group.

"But you, Jarvis—I hate to say it—you're a business coward. You knew

what you would have to do to get out of the small-pay class. You were simply afraid to face the kind of effort and responsibility that could get you a substantial salary.

"And now it's too late. We've got to cut our overhead, and you're one of about fifty men that we can get along without. We could replace the lot of you tomorrow.

"For your own sake, Jarvis, take a tip from a man who has been through the mill, and this time get busy and learn to do something better than the other fellow.

"Jarvis, there's no end of opportunity in business; but the only man who cashes in these days is the man with the courage to get special training. The offices of this country are simply cluttered up with business cowards. It's easy for the man who trains—because the business coward is through before he starts."

\* \* \*

Are YOU one of several million routine men who have been drifting along in a "low-pay" job—always wishing for more money, never acting?

Are YOU a business coward?

Nearly a million ambitious men have asked themselves this question during the past thirty years—and replied with a ringing "NO!"

In the quiet of their own homes, without losing an hour from work, these men have mastered the principles of business by working out the actual problems of business—under the direction of experienced, able business men in their respective fields. Their record of



achievement under the "LaSalle Problem Method," is one of the most thrilling chapters in the romance of business.

These men were able to progress more rapidly by means of the "LaSalle Problem Method" than they could probably have done in any other way, because in their training they faced continually the very problems they must later face on the bigger job. They learned by doing.

Moreover, studying alone under the direct supervision of an expert instructor, they progressed as rapidly as their capacity allowed—and that progress was further speeded by the fact that every day they could see themselves developing. This fact took most of the hardship out of study—changed it into a fascinating game, with always the goal ahead of increased opportunity and greater pay.

Whatever attitude you may have taken in the past, resolve today to face the problem of your business future squarely.

Within reach of your hand is a LaSalle coupon—and a pen. If the pen isn't handy, a pencil will do just as well. The coupon, checked and signed, will bring you without obligation a complete outline of the training you are interested in, together with full particulars of our convenient payment plan; also your free copy of the inspiring book, "Ten Years' Promotion in One."

It costs you nothing to get the facts—except the exercise of business courage. Will you put it off?—or put it over? Mail the coupon NOW.

## LASALLE EXTENSION

— — — — — Find Yourself Through LaSalle — — — — —

LASALLE EXTENSION, Dept. 583-R

CHICAGO

I would welcome an outline of the LaSalle plan, together with a copy of "Ten Years' Promotion in One," all without obligation.

- ☐ Business Management
- ☐ Higher Accountancy
- ☐ Expert Bookkeeping
- ☐ C. P. A. Coaching
- ☐ Modern Salesmanship
- ☐ Traffic Management
- ☐ Modern Business Correspondence
- ☐ Stenography—Stenotypy

- ☐ Law: LL.B. Degree
- ☐ Industrial Management
- ☐ Modern Foremanship
- ☐ Credit and Collection Correspondence
- ☐ Business English
- ☐ Commercial Law
- ☐ Effective Speaking
- ☐ Railway Accounting



Name..... Present Position.....

Address.....

**free!**  
mail  
coupon  
now



# Oh Boy! How Grand I Feel

"NOW I know there IS a difference in the way laxatives work since I used the ALL-VEGETABLE Laxative, Nature's Remedy (NR Tablets). One NR Tablet convinced me... so mild, thorough, refreshing and invigorating."

Dependable relief for sick headaches, bilious spells and that tired-out feeling, when caused by or associated with constipation.

**Without Risk** try NR. Geta25c box from any druggist. Use for one week, then if you are not more than pleased, return the box and we will refund the purchase price. That's fair. Try it.



**NR TO-NIGHT**  
TOMORROW ALRIGHT



## EARN MONEY Stringing TENNIS RACKETS

An opportunity to earn as much as \$3.50 for a few minutes of your spare time. String your own racket and save money. Tennis rackets need restringing frequently. Every stringing means profit for you. No experience needed—we teach you how. TOMGUT Equipment makes it easy. Costs practically nothing to start. Easy work. Begin NOW!

**FREE** Write today and we will send you Free plan and Special offer on strings and stringing equipment.

**THOMPSON MANUFACTURING COMPANY**  
4529 Packers Avenue, Chicago, U. S. A.  
TOMGUT "Court-Tested" Tennis & Badminton Strings

- ☐ Send FREE plan and Special offer.
  - ☐ Send new booklet "400 YEARS OF TENNIS."
- Enclosed is 10c to cover mailing costs.

Name .....  
Address .....  
City..... State.....

MAIL THIS  
COUPON

## TRAIN FOR Radio IN 12 WEEKS

BY SHOP WORK—NOT BY BOOKS  
I'll Finance Your Training!

Prepare for jobs in Broadcasting, Talking Pictures, Television, Wireless, etc., by 12 weeks practical shop training in Coyne Shops. Free Employment Service. Many earn while learning. You don't need previous experience or a lot of book learning. Send coupon for BIG FREE RADIO and TELEVISION BOOK, and my "Pay-Tuition-After-Graduation" Plan.

H. C. LEWIS, President, Radio Division,  
Coyne Electrical School,  
500 S. Paulina St., Dept. 58-4H, Chicago, Ill.  
Dear Mr. Lewis:—Send me your big Free Radio Book and all details of your Special Tuition Offer—and about your "Pay After Graduation" Plan.

Name.....  
Address.....  
City..... State.....

## AVIATION Wants More LINCOLN TRAINED MEN

Train Now at this Government Approved Lincoln School for Good-Pay position as Pilot or Mechanic. Aviation's gigantic expansion program—calls for thousands more well trained men.

Be a Skilled Pilot. Lincoln's Government Approved Flight Training prepares you for any Pilot's License including Transport. Fleet of 14 Training Planes. Veteran Flight Instructors.

Be an Aviation Mechanic. Learn Airplane Engine Maintenance, Overhaul and Repair. Learn Airplane Construction; Sheet Metal; Welding. 12 Shops and Laboratories. Training prepares you for your Government Mechanic's License.

Come Now to Lincoln. A few short months of Government Approved Lincoln Training can have you ready for a Good-Pay position in Aviation. Employment Service given our Graduates. Write Today for complete information.

**LINCOLN AIRPLANE & FLYING SCHOOL**  
605 Aircraft Bldg. Lincoln, Nebraska

# Handy Aids for Home Mechanics



How the sturdy concrete frame is built into a wall

## Window Frames of Cast Concrete

SUITABLE for either remodeling work or new-home construction, a unique window frame made of precast, reinforced concrete is now available for installation in brick, stone, concrete, concrete-block, and stucco walls. Metal inserts built into the frames receive brass screws for fixing steel sashes in position, and permit easy removal of the windows for painting. Brass-lined channels on the inside and outside of the frames provide "tracks" for Venetian blinds and storm shutters. When not in use, the storm shutters slide back, like the top of a roll-top desk, into a space provided at the top of the frame. The frames, which are completely water-tight, are available in standard sizes, facilitating the work of the builder to speed construction operations and to cut down on building costs.

## Wall Insulation Has Built-In Spacers

IN A NEW, improved type of insulating material just placed on the market, special spacer flanges built into the material insure adequate air spaces between the insulation and the walls, ceilings, and floors, and eliminate the need of lathing. In use, the spacer flanges, which edge the insulating material on both sides, are fitted over adjacent studs, joists, or rafters and nailed or stapled in place, as shown in the photograph at the right.



The spacer flange being attached to a stud

## Portable Electric Mixer Aids Painters

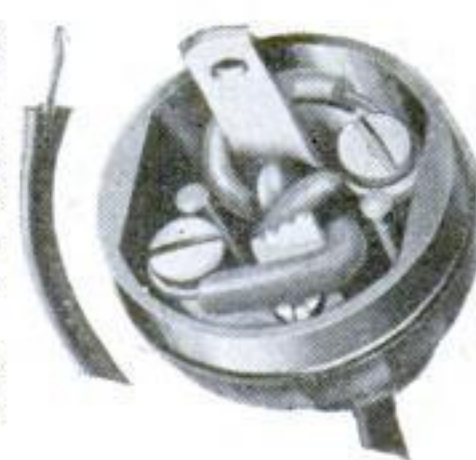


Stirring in paint with the portable mixer

RESEMBLING a food mixer for the kitchen, a new portable electric paint mixer makes it easy to blend colors for special jobs. The mixer, which consists of a powerful motor and twin mixing blades, can be clamped easily to the rim of an ordinary large-size paint can.

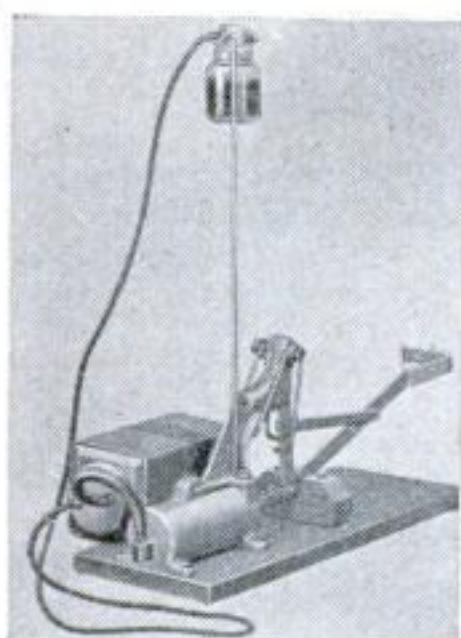
## Tape Splits Lamp Cord

RUBBER-COATED electric-lamp cord of new design is easily split into its two strands by simply pulling a "tape" encased between the wires, as shown at the right.





## Spray Gun Works by Foot Lever



WEIGHING less than ten pounds, a liquid-spray gun powered by a simple foot-operated pump to supply compressed air is now available for spraying paint, insecticide, and other fluids. A foot pedal works a pump feeding air into a small storage tank. Automatic valves then release the air at a uniform pressure through a flexible hose leading to the spray gun.



## Cranks Set In Casement Open Novel Windows

OPENED and shut by means of a crank set in the casement, a new window offered to home owners operates on the principle of the conventional automobile window. Turning the ornamental crank slides the panes of glass up or down, without moving the sash. A special strip, shown in the illustration above, forms a seal between the upper and the lower panes, preventing drafts when the panes are closed.

# SPURS OR WISHBONES?

● Overcoming obstacles on the path to success is something like "busting" bronchos. A man has to have nerve, determination, and courage. Above all, he must know how! And this is truer today than ever before.

I. C. S. can't supply the first three qualities. But it can—and will—provide the knowledge and training needed to get ahead!

You may be one of those fortunate few already prepared to step into a really big job. If not, I. C. S. is literally "at your service." Mail the coupon below—it may be your passport to a more abundant future!

## INTERNATIONAL CORRESPONDENCE SCHOOLS

BOX 7634-J, SCRANTON, PENNA.

★ Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," ★ and full particulars about the subject *before* which I have marked X:

<b>TECHNICAL AND INDUSTRIAL COURSES</b>			
<input type="checkbox"/> Architect	<input type="checkbox"/> Welding, Electric and Gas	<input type="checkbox"/> Mechanical Engineering	<input type="checkbox"/> Management of Inventions
<input type="checkbox"/> Architectural Draftsman	<input type="checkbox"/> Reading Shop Blueprints	<input type="checkbox"/> Mechanical Draftsman	<input type="checkbox"/> R. R. Locomotives
<input type="checkbox"/> Building Estimating	<input type="checkbox"/> Sheet Metal Worker	<input type="checkbox"/> Diesel Engines	<input type="checkbox"/> R. R. Section Foreman
<input type="checkbox"/> Contractor and Builder	<input type="checkbox"/> Machinist <input type="checkbox"/> Toolmaker	<input type="checkbox"/> Aviation Engines	<input type="checkbox"/> Air Brakes <input type="checkbox"/> Signalmen
<input type="checkbox"/> Structural Engineer	<input type="checkbox"/> Patternmaker	<input type="checkbox"/> Automobile Mechanic	<input type="checkbox"/> Chemistry <input type="checkbox"/> Pharmacy
<input type="checkbox"/> Structural Draftsman	<input type="checkbox"/> Boilermaker	<input type="checkbox"/> Plumbing	<input type="checkbox"/> Coal Mining
<input type="checkbox"/> Electrical Engineer	<input type="checkbox"/> Heat Treatment of Metals	<input type="checkbox"/> Steam Fitting	<input type="checkbox"/> Cotton Manufacturing
<input type="checkbox"/> Electric Lighting	<input type="checkbox"/> Bridge Engineer	<input type="checkbox"/> Heating <input type="checkbox"/> Ventilation	<input type="checkbox"/> Woolen Manufacturing
<input type="checkbox"/> Telegraph Engineer	<input type="checkbox"/> Bridge and Building Foreman	<input type="checkbox"/> Air Conditioning and Cooling	<input type="checkbox"/> Poultry Farming
<input type="checkbox"/> Telephone Work <input type="checkbox"/> Radio	<input type="checkbox"/> Highway Engineer	<input type="checkbox"/> Steam Engineer	<input type="checkbox"/> Agriculture
<input type="checkbox"/> Commercial Refrigeration	<input type="checkbox"/> Civil Engineer	<input type="checkbox"/> Steam Electric Engineer	<input type="checkbox"/> Navigation
	<input type="checkbox"/> Surveying and Mapping	<input type="checkbox"/> Marine Engineer	
<b>BUSINESS TRAINING COURSES</b>			
<input type="checkbox"/> Business Management	<input type="checkbox"/> Bookkeeping	<input type="checkbox"/> First Year College Subjects	<input type="checkbox"/> High School Subjects
<input type="checkbox"/> Industrial Management	<input type="checkbox"/> Secretarial Work	<input type="checkbox"/> Business Correspondence	<input type="checkbox"/> College Preparatory
<input type="checkbox"/> Traffic Management	<input type="checkbox"/> Spanish <input type="checkbox"/> French	<input type="checkbox"/> Stenography and Typing	<input type="checkbox"/> Illustrating
<input type="checkbox"/> Accountancy	<input type="checkbox"/> Salesmanship	<input type="checkbox"/> Civil Service <input type="checkbox"/> Mail Carrier	<input type="checkbox"/> Cartooning
<input type="checkbox"/> Cost Accountant	<input type="checkbox"/> Service Station Salesmanship	<input type="checkbox"/> Railway Mail Clerk	<input type="checkbox"/> Lettering Show Cards
<input type="checkbox"/> C. P. Accountant	<input type="checkbox"/> Advertising	<input type="checkbox"/> Grade School Subjects	<input type="checkbox"/> Signs
<b>DOMESTIC SCIENCE COURSES</b>			
<input type="checkbox"/> Professional Dressmaking and Designing	<input type="checkbox"/> Tea Room and Cafeteria Management, Catering		
<input type="checkbox"/> Home Dressmaking	<input type="checkbox"/> Advanced Dressmaking	<input type="checkbox"/> Millinery	<input type="checkbox"/> Foods and Cookery

Name..... Age..... Address.....

City..... State..... Present Position.....

If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

Learn a  
profitable  
trade



## DIESEL

### COMPLETE TRAINING

With all types internal combustion engines, electric power generation, etc. If you want to know about employment opportunities and employment requirements, write for free book of Diesel facts.

## NATIONAL SCHOOLS

Los Angeles

### Request for FREE BOOK

#### NATIONAL SCHOOLS

Dept. PSA-5, 4000 So. Figueroa St., Los Angeles, Calif.

NAME.....AGE.....

ADDRESS.....

CITY.....STATE.....

## FACTORY GUARANTEED

### NEW REMINGTON NOISELESS PORTABLE

10-Day  
Free  
Trial  
Offer



AS LOW AS

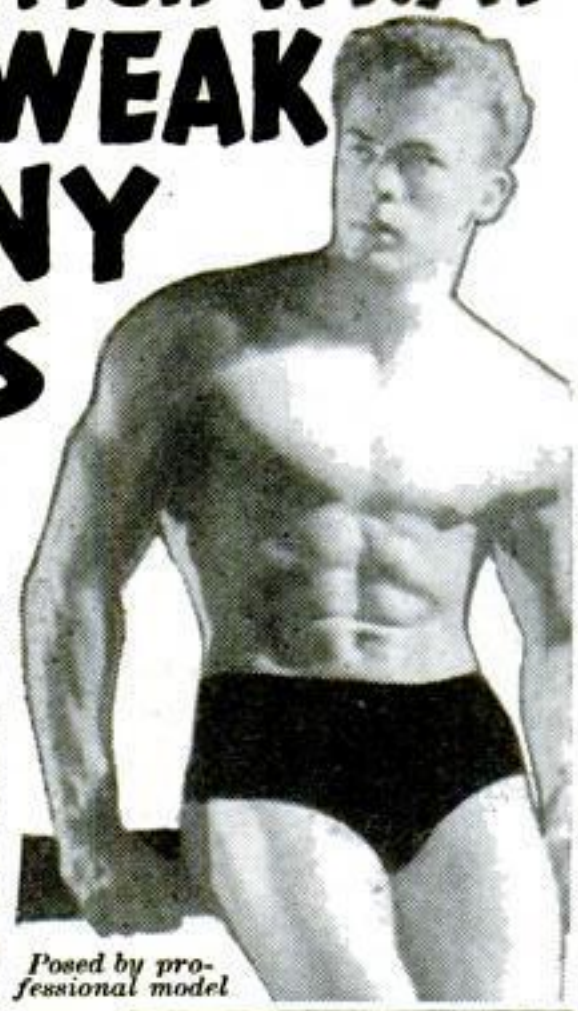
10¢  
A DAY

AT LAST! The famous Remington NOISELESS Portable is yours for as little as ten cents a day. Brand new. Not rebuilt. Standard keyboard and every modern feature. Includes carrying case and free typing course. 10-Day free trial. You don't risk a penny. WE PAY ALL SHIPPING CHARGES. Act now! Write Remington Rand Inc., Dept. 153-5. 465 Washington St., Buffalo, N. Y.



# This Iodine-Mineral Concentrate from the Sea is Often WHAT PALE, WEAK SKINNY FOLKS NEED!

Why Kelpamalt Has Quickly Built Husky New Pounds, Rugged Strength and Energy On Folks Who Thought They Ate Enough But Were Actually Suffering From



Posed by professional model

## MAL-NOURISHMENT

Gains of 5 to 15 Pounds in Few Weeks Reported Regularly

As the result of tests covering thousands of cases of skinny, weak, rundown folks, science now finds that the trouble can often be traced to MAL-NOURISHMENT. Doctors know appetite-satisfying foods are deceiving because frequently they lack vital minerals and essential vitamins needed for body-building. As a result, you do not get the good out of the food you eat and your system lacks in strength, energy and weight.

Many thousands of sickly, pale, ailing folks have found glorious relief with Kelpamalt, the amazing mineral-iodine concentrate, derived from a huge 90 ft. Pacific Ocean sea plant. This iron, iodine and vitamin concentrate is rich in vital elements necessary for the body's chemical processes. It contains assimilable iron, copper, phosphorus and calcium vitally needed for tissue building. Most important is Kelpamalt's natural iodine—not to be confused with ordinary, liquid, chemical iodine. Iodine, scientists say, is found in the blood, liver and glands. It is vitally important to their normal functioning.

In addition to these precious minerals, Kelpamalt contributes to the supply of the all-important vitamins, A, C, D, and G. It is only when there is an adequate supply of vitamins plus minerals that you can get the real good out of your food.

Try Seedol Kelpamalt for 1 week. See, if like thousands of others you don't feel better, sleep better, and add at least 5 husky new pounds the first week. If you don't, the trial is free. Your own doctor will approve this way. Get Kelpamalt now. It costs but little to use and is sold at all good drug stores.

## SEEDOL Kelpamalt Tablets

SPECIAL FREE OFFER!

Send for FREE fascinating, instructive 50-page book on How To Build Strength and Add Weight. Information on Minerals, Iodine, and Vitamins and their effects on the human body. Weight and measurement charts. Daily menus. No obligation! Kelpamalt Company, Dept. 1428, Long Island City, N. Y.

## AVIATION NEEDS MEN



Southern California, world's aviation center, needs trained men to build and fly planes. Only trained men accepted. Get quicker, lower-cost training at California Flyers, leading flying-mechanical school in this great aviation center. Secure steady employment, make big money, get the thrill of a red-blooded job in aviation.

CALIFORNIA FLYERS  
LOS ANGELES, CALIF.

Send for California Flyers FREE Book

California Flyers, Los Angeles Municipal Airport, Inglewood, Calif.

Name \_\_\_\_\_ Age \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_ PS-5

## Complete Electric Plants



Onan A. C. plants furnish same current as city lines, 110 Volt, 60 Cycle. For farms, camps, construction jobs. Operate radios, water systems, all appliances. New models, 350 to 5000 watts. 6, 12, 32 and 110 volt D.C. Models \$57.50 and up. Also combination A.C. - D.C. units. Shipped complete, ready to run.

Write for details.  
D. W. ONAN & SONS  
1690 Royalston Ave., Minneapolis, Minnesota

## Can Saves Shellac



BUILT in three sections, a handy new container for shellac resists corrosion, preserves the liquid from evaporation, and prevents drying out of the brush. The top and the base, shown at the left, are of copper, housing a corrosion-resisting aluminum can for the shellac.

## Transformer Steps Up House-Current Voltage

HAVING three different voltage taps, a new booster transformer is designed to raise deficient house-current voltage to the point where it will operate household appliances at their proper rate and efficiency. In districts where the voltage is below normal, the transformer may be tapped at 100, 115, or 125 volts, according to the requirement specified by the manufacturer's rating tag on the refrigerator motor or other electrical device.

## Questions FROM HOME OWNERS

Q.—Our window screens are riddled with a number of tiny holes. What is the best way to patch the screens, at least for the time being?—H.L.Y., Lexington, Ky.

A.—IF THE holes are very numerous, it would be best to buy good screening and recover the frames. However, if you do not want to go to that expense, you can secure a spool of wire of the same dimensions as the screen wire and then "darn" the holes by weaving the wire back and forth to form a patch of the same mesh as the screen. Another method is to fit a section cut from an old screen over the hole and wire it securely in place. An easy way to do this is to fray the edges of the patch, then bend the end wires of the patch into the old screen to hold it firmly.

## Bran Cleans Bearskin Rugs

B. N., TACOMA, WASH. A good way to clean a bearskin rug before storing it away for the summer is to apply hot roasted bran, rubbing it all through the fur. Let it remain in the rug for about an hour or so, and then brush it out.

## Frosting a Bathroom Window

Q.—IS THERE an inexpensive way to frost the plate-glass window of our bathroom to make it nontransparent?—K.D.L., Wichita, Kans.

A.—MAKE a solution by mixing a tablespoonful of well-ground whiting with two or three quarts of milk. Apply

(Continued on page 17)

**YOU CAN LEARN TO DRAW**

AT HOME—IN YOUR SPARE TIME

Here's fun and profit in your spare time. The W. S. A. Way to success in Art is pleasant and interesting... and can give you the ability to do—

**COMMERCIAL ART ILLUSTRATING CARTOONING**

Many of our successful graduates never studied Art before enrolling with W.S.A. You have the same opportunity to be an Artist. Our proven, practical training has been successful since 1914. Write for FREE BOOK—"Art for Pleasure and Profit". State age and occupation.

STUDIO 135E 1115-15th ST. N. W. WASHINGTON SCHOOL OF ART WASHINGTON, D. C.

## Home Study Accountancy Training

Accountants who know their work command responsible positions and good incomes. And the need for trained accountants is growing. About 16,000 Certified Public Accountants in U. S. and many thousands more executive accountants. Many earn \$2,000 to \$15,000. We train you thoroughly at home in your spare time for C. P. A. examinations or executive accounting positions. Previous bookkeeping knowledge unnecessary—we prepare you from ground up. Our training is personally given by staff of C. P. A.'s. Low cost—easy terms. Write for valuable free 64-page book describing opportunities in accounting field and telling how you may enter it successfully.



This Book FREE!

LASALLE EXTENSION, Dept. 583-H, Chicago

**ENGINEERING DEGREE IN TWO YEARS**

B.S. Degree courses in engineering: Electrical, Civil, Chemical, Mechanical, Mech. Drafting, Radio and Television, or Aeronautical. Intense, practical, thorough program. No extras for preparatory or review. Earn board if desired. Low tuition. Enter March, June, Sept., Dec. Catalog.

243 E. Washington Blvd., Fort Wayne, Ind.

**INDIANA TECHNICAL COLLEGE**

**EARN MONEY MAKE COLOR-GLAZED CONCRETE PRODUCTS**

New low cost method. No molds, power or costly tools. You build your own equipment from plans we furnish. No experience needed to make color-glazed concrete pottery, wall tiles, statuary casting, giftware—in home or shop.

**MEN—Send 10c TODAY for booklet, and details of this money making business.**

**NATIONAL POTTERIES COMPANY**  
Room 7, 13 W. 26th St., Minneapolis, Minn.

**Diesel**

For several years, Diesel engines have been replacing steam and gasoline engines in power plants, motor trucks and busses, locomotives, ships, tractors, dredges, pumps, etc. And now the first Diesel-powered passenger car is on the market. Our home-study course offers you a real opportunity to prepare for a worth-while position in this new field. Write TODAY for full information. No obligation.

**American School, Dpt. D-546, Drexel at 58th, Chicago**

**CARTOON YOUR WAY TO SUCCESS!**

DON'T COPY - LEARN TO ORIGINATE!

RAYE BURNS will teach you HOW to CREATE ORIGINAL CARTOONS at home that you can SELL! Course contains 26 lessons and over 600 illustrations. Only \$3.85

Send name and address for free details.

**RAYE BURNS SCHOOL, Dept. S, BOX 2194, Cleveland, O.**

**"OIL DOES NOT WEAR OUT"**  
(U. S. BUREAU OF STANDARDS—BUL. 86)

**THEN WHY CHANGE OIL?—** Because ordinary oil filters remove solids only and none of the other destructive foreign matter.

**RECLAIMO—The Super Filter-Refiner** not only removes solids, but also evaporates gasoline dilution, water, corrosive acids thru the use of exhaust heat—KEEPING the oil CLEAN and OILY indefinitely! Attached to Autos, Trucks, Tractors and Diesels in place of now obsolete oil filters, RECLAIMO MAKES OIL CHANGING A THING OF THE PAST. Add oil only to maintain level. Thousands of ENTHUSIASTIC OWNERS Read some of their remarkable statements in our FREE Booklet "Oil Facts"—tells you plenty about oil and may save you a lot of money—sent FREE with 90-Day Trial Offer. Write today.

**Reclaimo Mfg. Co., Dept. F, 2306 N. Western Av., Chicago**



# EASY

## SOPRANI AMPLIPHONIC

### Simplifies Playing

● Lighter, easier to play, less bellows-ing, plus more beau-tiful tone and vol-ume, — that's how Soprani's exclusive Ampliphonic fea-ture has simplified this accordion. As-sures rapid prog-ress. Home trial. Easy terms. See your music dealer or send for beautiful free book. Write today.



SOPRANI, INC. Dept. 531, 630 S. Wabash Ave. Chicago, Illinois

## THE BOOK THAT HAD TO BE PRINTED!

### Shows the Way to Perfect Marriage and Successful Living

A free-thinking and enlight-ened age demanded the print-ing of the new book by Drs. Sadler, two eminent physicians and psychiatrists. It gives the secrets of Nature's most powerful and intriguing force. Shows how this force, when properly understood and guided, can bring "perfect" marriages and happy con-tented living. A frank and fearless discussion, written in plain everyday language for both married and unmarried men and women. A practical and necessary aid to parent-hood and child training. Learn how this exciting book can help you. Write today for "The Open Door." Send no money, just your name and address. Mail to:

Clarkson Publishing Company, Dept. 135, 1259 Wabash Ave., Chicago



### Woodworker's Turning and Joining MANUAL

The simplest, most practical ways to make end tables, chairs, benches, high-boys, book-racks, cabinets, all kinds of furniture in your spare time. A revela-tion of simplicity and helpfulness. Many illustrations. Full cloth bound \$1.00.

POPULAR SCIENCE MONTHLY, Dept. 58

353 Fourth Ave.

New York, N. Y.



### SHIP MODEL MAKING

New book shows how to make any model. Shows the short cuts, kinks, time-saving methods of experts. Complete plans for gorgeous gal-leon, clipper ship, etc. Almost 100 illustrations. Full cloth bound \$1.00. Popular Science Monthly, 353 Fourth Ave., New York.



### PHOTO ENLARGER \$5.94

Money back guarantee A REAL Photo Enlarger that does fine work. Focuses automatically. Also COPIES and has a Contact Printer and Retouching Table. Interesting circular free. Only \$5.94 complete, Lens included. IDEAL-I, 122 East 25th St., New York

### Learn to MOUNT BIRDS

#### Tan SKINS, Make Up FURS

Be a Taxidermist. We teach you at Home. Mount Birds, Animals, Pets, common specimens. Save your hunt-ing trophies; decorate home and den. Make genuine KROME LEATHER, tan and make up furs for sparetime profit. FREE BOOK 48 pages—tells all about it. Hunters, get this wonderful book. Its Now Free. Send postal card Today—This Minute! State your AGE.

N. W. School of Taxidermy, 3395 Elwood Bldg., Omaha, Nebr.



## Questions from Home Owners

(Continued from page 16)

this to the glass with a paint brush, and then stipple the surface with a dry, soft brush. Another method is to mix sugar of lead with varnish, and apply it in the same manner outlined above.

### Repairing Veneer

S. N., TROY, N.Y. In replacing veneer, do not apply the glue to the veneer. Ap-ply it to the board only. Then put the veneer in place and clamp the pieces together as quickly as possible.

### Tree-Cement Formula

Q.—CAN you give me a good formula for a tree cement to patch up the trunk where a branch has been torn away?—B.D., Chattanooga, Tenn.

A.—BIND the fracture with a cement made by melting ten parts of pitch and adding, successively, one part of turpen-tine, two parts of tallow, and one part of methylated spirits—ordinary alcohol which has been denatured with methyl alcohol.

### Making Glue Flexible

J. O'D., MALDEN, MASS. Adding one part of glycerine to four parts of ordi-nary glue may help to make the ad-hesive flexible.

### Attaching Window Boxes

R. K. G., BUFFALO, N. Y. When attach-ing window boxes to the wall of a con-crete house, you must first obtain a sur-face into which you can nail the wooden frames. Using a hammer and cold chisel, cut holes in the concrete at the point where nails will enter the wall. Plug the holes with wooden pegs driven in with a hammer. It is then an easy matter to drive nails through the window-box frame into the wooden plugs.

### Grass-Seed Requirements

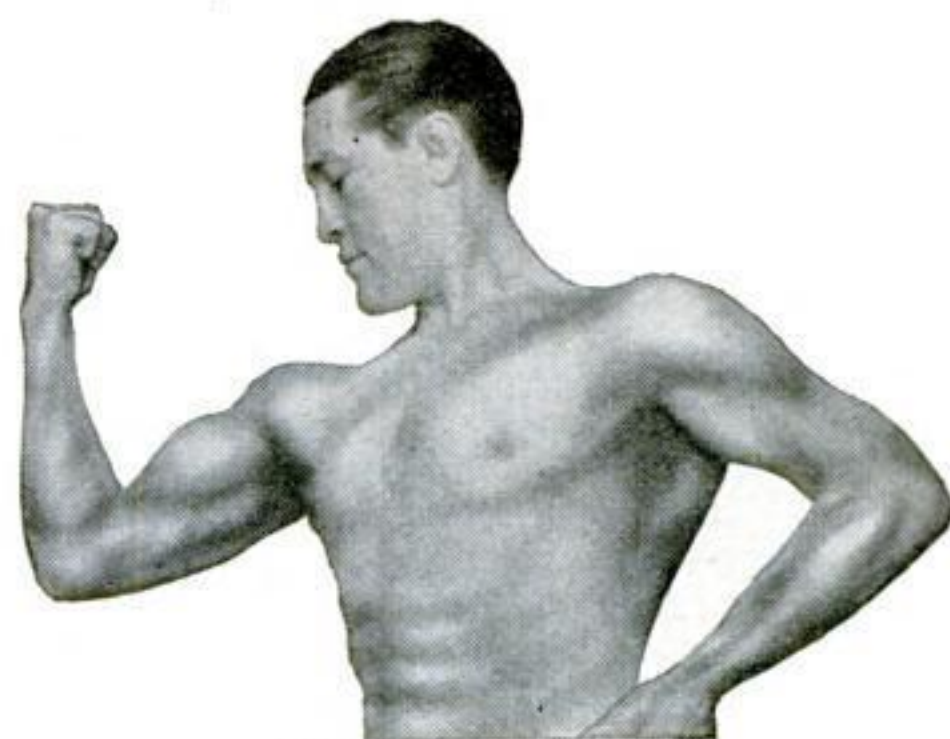
V. A. K., DAYTON, OHIO. About one pound of grass seed should be used to sow each 300 square feet of lawn. Sow the seed on a windless day, scattering it as evenly as possible. It is a good idea to seed the ground twice, walking first in one direction and then retracing your steps. Use a fine spray from your hose to water the soil so that you do not displace the seeds.

### Test for Hard Water

G. B. L., OMAHA, NEBR. You can test water for hardness by adding a few drops of a solution of soap and alcohol. If the water is hard, the mixture will cause white flakes to form in the water. Soft water, however, will remain clear.

### Paint in Good Weather

T. F., CLINTON, IND. Do not paint out-doors in frosty, damp, or any kind of unfavorable weather.



TOMMY LOUGHRAN

Undeclared World Champion. Photo taken Feb., 1938

## A WORLD CHAMPION

TELLS HOW TO

### Build A Powerful Body

THE SECRET'S OUT: Well, fellows—here's the lowdown. Don't think I always had this swell physique—and don't think it just naturally grew on me. When I first started boxing, I was tipped off that a champion must be able to take it—as well as dish it out. The fighting game is hardly a ping-pong contest. You have to meet human gorillas. To swap punches for twelve and fifteen rounds requires an enormous amount of energy and stamina—That is why it was neces-sary for me to first build up a sturdy body be-fore I could ever amount to anything as a fighter. And that is just what I did.

A NEW LIFE To win my first important fight was nothing com-pared to the joys I experienced from possess-ing this strong, healthy body. From that day on, I decided I would possess a perfect physique as well as be a boxing champion. My record speaks for itself as to whether I accomplished my am-bition.

All these years while I was working my way to the top, I kept investigating and studying every known method of physical development until I finally discovered the secret of "PUIS-SANT POWER."

### Learn from a Champion

It took me years of study and research—also thousands of dollars to acquire this knowledge of building muscles which possessed the power of an ox, but the speed and agility of a panther. These are the only type of muscles which enable you to engage in active sports or to really accom-plish anything. It was not long until I was re-ceiving offers galore, if I would only impart this knowledge and train others through this short but certain method of body building. Days were all too short to satisfy the demands on my time. I decided to have duplicates made of my appar-at-us and put the instructions into printed form. In this way I am now enabled to spread the joy-ful message to the world.

### Send for My FREE Book "Puissant Body Building"

This contains numerous photos of the athletes and strong men I have trained. It will be an im-petus and an inspiration to you. I don't ask you to buy it. I want to spread the glad news. It is absolutely free. Yours to keep.

Don't delay. This does not obligate you in any way whatever. It is merely an inspirational talk and will show what I have done for so many others.

#### ACT TO-DAY

Do you wish these mighty muscles for yourself? Write at once and I will tell you how you can soon possess them. You will feel the thrill of a new life puls-ing through your veins —you will shout to the world "I'm a man and I can prove it."

#### FREE

For the next thirty days I will send you with my free book, a beautiful reproduction of my por-trait, made by a famous artist. Only those who send for my booklet will have this autographed reproduction.

### TOMMY LOUGHRAN

Dept. 50 4 So. 15th Street, Philadelphia, Pa.

#### TOMMY LOUGHRAN, Dept. 50

4 So. 15th Street, Philadelphia, Pa.

Dear Tommy:—Please send that book "Puissant Body Building." I want a strong, active body like yours. This book is absolutely FREE with the understanding that I am not obligated in any way.

Name.....

Street.....

City..... State.....



# Classified Section

CLASSIFIED ADVERTISING is inserted in these columns at the special rates of: 20c a word per insertion for 12 consecutive issues, 25c a word for 6 consecutive issues, 30c a word for 3 consecutive issues, 35c a word for one issue. Minimum ad accepted is 10 words. Each insertion is payable in advance. Copy and remittance for the June issue (on sale May First) must reach this office not later than April First.

POPULAR SCIENCE MONTHLY, 353 FOURTH AVE., NEW YORK CITY

## ADVERTISING AGENCIES

LEARN advertising quickly at home. Easy, practical plan. No text books. Common school education sufficient. Interesting booklet and requirements free. Page-Davis School of Advertising, 3601 Michigan Avenue, Dept. 1745, Chicago.

YOUR ad in 1,500,000 Sunday newspapers (National circulation) \$15.40 inch. Send ad with remittance. Proof of insertion guaranteed. Chicago Advertising Agency (Established 1900), 20-PS West Jackson, Chicago.

INCH display advertisement 30 magazines year \$24. Wood's Popular Services, Atlantic City, (N. J.)

INCH display, 20,000 MO magazines, 75c. Parker Publications, Peterboro, Ont., Canada.

24 WORDS, 40 newspapers, \$2.00. Goodall Agency, 742 Market, San Francisco.

## AGENTS WANTED

100% PROFIT in new perfected (1938) Quick action self starting cigar lighter. No flint or friction. No wind can blow it out. Retail 25c. Sample and can of fluid 25c. New Method Co., Box PS-64, Bradford, Pa.

JUST out! Amazing fast selling 25c household necessity. Saves hundreds of dollars. Sell 3 to 4 each home. Make up to \$6 daily. Free sample. Puro, 3107 Pine, Dept. E-808, St. Louis, Mo.

OPENING new local coffee agencies. Need men immediately to supply regular consumers. Start with earnings up to \$45.00 in a week. Must write quick. Albert Mills, 6228 Monmouth, Cincinnati, Ohio.

BIG Money applying initials on automobiles. Easiest thing today. Free Samples. Also, sideline salesmen for name plates and tire cover transfers. "Ralco", 1305 Washington, Boston, Mass.

PROFIT with new products. Make, sell, repeat. Analysis. Research. Guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, FB-1142 Sunnyside, Chicago.

A BUSINESS of your own—making Palmer's original chipped glass name plates, numbers, mirrors, signs. Illustrated literature and sample free. E. Palmer, 520, Wooster, Ohio.

500% PROFIT quick-action Automatic Gas Lighter. No flint. 25c seller to every home, office and restaurant. Sample 10c. New Method Co., Box PS-64, Bradford, Pa.

BIG money applying initials on automobiles. Write for particulars and free samples. American Letter Company, Dept. 47, Dunellen, N. J.

ATLAS Window Sign letters. Large Sizes. Penny Each. Beautiful Free Samples. Atlas, 7941-J, Halsted, Chicago.

EXCLUSIVE representatives appointed. Faucet water softener. Revolutionary. Luxusoft, Sausalito, Calif.

ELECTRIC Welders, 110-220 Volt, fan-cooled, can be used for hours, \$75.00. Box 331, Hamilton, Ont., Canada.

MEXICAN curios, tremendous money-makers! Samples 10c. Marquez-I, Apartado 1176, Mexico City.

SELL made to measure raincoats. Outfit free. Goodyear Rainwear, 106 East 19th, New York.

MAKE products yourself. Formula Catalog Free! Kemixco, 180 Parkridge, Ill.

HANDY men—earn money home operating Community "Fix-It" Shop. Stafford, Makanda, Ill.

## AIR CONDITIONING

BUILD Your Own Air-Conditioning Outfit. Have mountain air, year-around health, and comfort in your home, store, office, workshop. Seven Units, Summer, Winter, year-around. Materials picked up at small cost. Complete diagrammed Servatex Instructions, Seven Blueprints, make construction simple and easy. Written Money-back Guarantee. Send \$1.00 (or pay postman \$1.15). Servatex Co. 888-PSM Madison Bldg., Milwaukee, Wisc.

## ANTIQUES, RELICS INDIAN GOODS

24 INDIAN relics \$1.00. 8,000 bargains: Spears, arrowheads, Tomahawks, Pipes. Photolist 10c. Museum, Rutland, Ill.

100 GOOD ancient arrowheads \$3.00; Tomahawk head 50c. Flint knife 25c. Illustrated catalog 5c. H. Daniel, Hot Springs, Ark.

ANTIQUE rifles, pistols, powder-horns, flasks, daggers, swords. Lists free. Nagy, 8F South 18th, Philadelphia, Pa.

BOOKLET on Indian Lore, Antique Firearms. (21 photographs) 10c. Museum, Rutland, Ill.

## AUTHORS' SERVICE

SHORT stories revised, typewritten, marketed. Details free. Hursh Service, Box S-1013, Harrisburg, Pa.

WANTED—Authors' manuscripts for immediate marketing. Free examination. Revel, 41 West 45, N. Y.

## AUTOMOBILES

MIDGET Autos! Motors! Parts! Used, new; sport, racing. Over 20 midgets, 80 motors, \$4.00 up. Latest lists, 20c. Shipps Midgets, Box 543-K, Zanesville, Ohio.

## AUTO SUPPLIES & EQUIPMENT

CONVERT your car to burn Diesel oil. Save up to 70% fuel costs. Cheap installation. Wonderful performance. Proven factory method. Different and better. Costs nothing to investigate. Write for free circular No. 3. Harrington Company, 201-204 Manchester Bldg., Portland, Ore.

BUY guaranteed auto battery direct. Liberal allowance old battery. Both delivered free. American Battery Company, 207 W. Kinzie, Chicago. Established 1889.

R & R Mfg. Co., Anderson, Indiana, U. S. A. Speed equipment for Fords and Chevrolets. Racing Cars and Midgets. Catalogue 25c. Foreign Coins accepted.

FORD, Chev. owners, save gas, increase power with Vacumatic gas saver, 85c. Al Maw, 521 Roxbury, Beverly Hills, Calif.

"ECONOMY Plus Power", super-charger, and engineering marvel. Slashes driving costs, \$22.50. Nil-Mellor, Waldorf-Astoria, N. Y. Send for booklet.

FORD V-8s, 1935-38: Gasoline saving device \$1.00. Walert Company, 3429 N. 10th Street, Milwaukee, Wis.

## AVIATION

GET into aviation. Air transport pilots get up to \$6,000 per year, mechanics \$2,500. Learn at this Government approved school. Write for complete information. State age. Lincoln Flying School, No. 2101, Aircraft Building, Lincoln, Nebr.

AVIATION apprentices. Good pay—big future. Write, immediately, enclosing stamp. Mechanix Universal Aviation Service, Strathmoor Station, Dept. H-2, Detroit, Mich.

INEXPERIENCED workers, apply for aviation jobs now. Full salary while learning. Details for stamp. Airpoyment, Box 553, West Los Angeles, Calif.

AERO-SLEDS for ice or snow transportation. Supplies. Details dime. Adastik Bros., Grand Rapids, Mich.

## BATTERIES, GENERATORS, ETC.

EDISON lifetime storage batteries for light and power. Eliminate acid battery diseases. Long guarantee. All kinds rebuilt generating plants, motors, and miscellaneous articles at bargain prices. Free interesting literature. W. Hawley Smith Company, Croton Falls, N. Y.

A.C. GENERATORS, hand-driven, generates 110 volts, original price \$5.50. Special 98c. Electrical Salvage, Box 524-77, Lincoln, Nebr.

## BLUEPRINTS & PLANS

FIFTY cents brings you a book containing complete instructions, diagrams and specifications for building fireplaces at less than half cost. Fireside Company, Albany, Ore.

NEW! Build portable sunbathing float! Boat! Inflated. Directions 15c. Schoolmeesters, 216 N. Webster, Saginaw, Mich.

SUMMER cottage \$100.00 complete. Write Lissner, 9639 Corona Ave., Corona, N. Y.

BIRD House blueprints, 10c each. G. Jepson, 106 Prospect St., Nutley, N. J.

## BOATS, OUTBOARD MOTORS, ETC.

SHIP model construction sets, blueprints. Largest and finest selection of separate fittings. Leading manufacturer of model racing yacht fittings and sails. Send 20c (coin) for illustrated catalog. A. J. Fisher, 1002-S Etowah Ave., Royal Oak, Mich.

ASSEMBLE your own boat. Our knockdown frames and materials save you 1/2 builder's cost. All types and sizes. Send 25c for big catalog, Brooks Boat Company, PS7, Saginaw, Mich.

ELECTRIC outboard from old automobile generator. Operates with car battery. Smooth—quiet. Easy to build plans 10c. LeJay Manufacturing, 523 LeJay Building, Minneapolis, Minn.

USED outboard motors. All makes, parts and accessories. Used propellers. Details for stamp. Outboard Headquarters, 305 Atlantic Ave., Boston, Mass.

BOAT blueprint patterns. Illustrated catalogue 10c. Cleveland Boat Blueprint Co., Station A, Cleveland, Ohio.

BOATS and engines. New, used. Write for lists. Aero Marine Service, Russells' Point, Ohio.

## BODY-BUILDING COURSES

EXERCISE equipment, courses. Special offers! Free booklet. Good Barbell Co., Dept. 6, 947 Elm, Reading, Pa.

## BUILD IT YOURSELF

BUILDING material bargains. Buy direct from mill and save! Low prices on everything needed to build, repair or remodel... lumber, roofing, flooring, screens, windows, hardware, barn sash, paint, etc. Free estimates on lumber bills. Guaranteed materials. Big new building material. Catalog free. Write Gordon Van Tine Company, Dept. B13, Davenport, Iowa.

BUILD Power Scooters, Midget Cars. We supply tires, wheels, motors etc. Lowest Prices. Bild-ur-own Devices, 5240 Lake, Chicago.

BUILD 9x15 printing presses, air conditioners, tubular furniture, trailer homes, Cuts, etc. Details. Huebl Coaches, LeSueur, Minn.

## BUSINESS OPPORTUNITIES

IF you have some spare room, a basement or garage, where you can do light work, we can offer you a profitable proposition for 1938 casting 5c and 10c Novelties, Ashtrays, Toy Autos, etc., for firm of many years standing. No experience necessary as we furnish full instructions with moulds. A rare opportunity to devote your spare or full time to profitable work. For details write: Metal Cast Products Co., Dept. E., 1696 Boston Road, New York City. WE start you in business, furnishing outfits and instructions, operating Specialty Candy Factory home. Men and women earn \$25 up to \$60 weekly, all for spare time. (Our 29th year.) Booklet free. W. Hillyer Ragsdale, Inc., Drawer 14, East Orange, N. J.

FASCINATING business. Repair, adjust typewriters, adding machines. Learn easily at home from factory expert. Earn up to \$15.00 daily. Complete instructions covering all makes \$3.00 postpaid or sent C.O.D. Adding Machine Equipment Service, 3601 Michigan, Dept. 1745, Chicago.

MAKE artificial marble. Glazed tiles, uncanny. Tabletops, plaques, floors, hones, novelties. Hard, fireproof, inexpensive, cement secrets. Brilliant tile and liquid rubber samples 3c. John J. Payn, 945 Grande Vista Avenue, Los Angeles, Calif.

CASH paid for snapshots! Publishers demand thousands. Earn money supplying them. Simple; profitable. Stamp brings details. Division 54. International Photos. Hohm Building, Sixth and Western, Hollywood, Calif.

COLOR concrete surface with chemical solutions. Beautiful pottery without moulds. Garden wishing-wells. Stucco rock. Glazing concrete. Sample 10c. Hollywood Cement Craft, 8530 Wonderland, Hollywood, Calif.

FOR a highly profitable lifetime business, operate a collection-credit agency. Free information. Cole Associates, Syracuse, N. Y.

PROFIT with new products. Make, sell, repeat. Analysis. Research. Guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, FC-1142 Sunnyside, Chicago.

1939 PROPOSITION. Just out for opportunity seekers. Dime brings particulars. F. N. Hutchison, 314 N. 4th, Camden, N. J.

FREE booklet describes 107 plans for making \$20-\$100 weekly, in home or office, business of your own. Elite Co., 214-A Grand St., New York.

LIKE to draw? Earn steady income tracing and duplicating cartoons for advertisers. Adservice, Argyle, Wisc.

COUNTRY Drives or movies afternoons! Work mornings home. No canvassing! Folios, Station D, Los Angeles.

WHERE to buy at wholesale 500,000 articles. Free directory and other valuable information. Maywood SS Publishers, 925 Broadway, N. Y.

SELL by mail; big profits. Stamp brings literature. Hunt Products, 49 Edgemere, Trenton, N. J.

EARN extra money spare time. No canvassing or manufacturing. Business Opportunities, Saint Paul, Minn.

PROFITABLE pleasure—window sill farming—Investigate. C. E. Farms, Highland Park, Los Angeles.

STORAGE battery recharging compound. B. Omoto, 2819 Hyperion, Hollywood, Calif.

WHERE to buy at lowest wholesale prices. Information free. Yorena, Box M-312, Bayonne, N. J.

PLASTEX Industries offer industrious men an opportunity to start a business of their own, manufacturing art goods, novelties and utility products in Plastex and marble imitation. 1/2c material makes regular 10c store sellers. Rubber moulds furnished for speed production. Small investment brings big returns. Nationwide demand in these low priced goods. Ambitious men have chance for real prosperity. Plastex Industries, Dept. S., 1085 Washington Ave., New York, N. Y.

BUSINESS proposition resilvering mirrors, autographs, reflectors, making chipped glass signs. Write, Sprinkle, Plater, 910 Marion, Ind.

## BUSINESS SERVICE

DICTAPHONE—Listen in on private conversations. Quickly connected from simple parts. Plan 25 cents. Traileradio, Bloomington Station, Minneapolis, Minn.

\$2.00 MONTHLY maintains Washington, D. C. office. Business or personal purposes. Hawkins Mail Service, 817-A Fourteenth.

## CAMERAS, PHOTO SUPPLIES

BASS, world headquarters for camera bargains, offers you from his new fifty-two page Bargaingram the following typical values. Order with full confidence—money back without question. Half V.P. Dolly, Xenon F:2 lens, Compur shutter at \$39.50. Kodak Duo Six-20, with F:3.5 lens, Compur Rapid shutter-\$35. 3 1/4x4 1/4 Auto-Graflex, Kodak F:4.5 lens \$42.50. Candid Dollina Model O, F:4.5 lens \$18.90. 35mm. Welta Candid, Xenon F:2 lens, Rapid Compur \$49.50. Order from above, or send for Bargaingram to Bass Camera Company, Dept. SP, 179 W. Madison Street, Chicago, Ill.

CAMERAS and supplies. Free illustrated catalog listing everything photographic—still and movie cameras, films, lenses—at tremendous savings. Hundreds of bargains, new and used. All guaranteed. We take your old camera or equipment in trade. Write now for your free copy of our newest money-saving bargain book—just out! Limited edition. Hurry! Central Camera Co., (photographic headquarters since 1899), 230 South Wabash, Dept. 5-S, Chicago.



**ABSOLUTELY free!** During this Advertising Campaign! New Movie-matic, all purpose—3-in-1 camera. Included with this remarkable Movie-matic all purpose Camera—a Keystone Motor driven projector at no cost to you. Write today! Right Now! Enclose 3c stamp for details of this amazing offer. Master Distribution Corp., 18 East 48 St., New York City.

**MAKE money in photography.** Learn quickly at home. Spare or full time. Easy plan. Previous experience unnecessary. Common school education sufficient. Interesting booklet and requirements free. American School of Photography, 3601 Michigan Ave., Dept. 1742, Chicago.

**20% TO 40% discount on films, paper, still or movie cameras.** Write: Paramount Co., 327-PS, East 92nd St., New York.

**SENSATIONAL booklet, 101 photographic trade secrets, 50c.** Samples from booklet sent free. Oylo Studio, Est. 1891, Brookings, So. Dak.

**AMATEUR photographers—printing box, with automatic switch, \$3.00 postpaid.** Harold Cutler, 131 South Branch Street, Bennington, Vermont.

**FREE! book, "How to Sell Snapshots".** Fomo Company, Canton, Ohio.

**SAVE 30% on film; up to 25% on cameras, supplies.** Economy Photo, Box 157-M, Greensburg, Pa.

#### CAPITAL

**HOW to obtain capital, fully explained, particulars free.** Star Service, Wapakoneta, Ohio. Established 1934.

#### CARTOONING, WRITING, SHOW-CARD, SIGN PAINTING

**ART magazine.** Helps you sketch human figure, paint, model, carve, cartoon, sell drawings, exhibit, form clubs. Regular 50c value—two for 25c while samples last. Publisher, 320 West Doty, Madison, Wisconsin.

**500% PROFIT!** Gold and colored sign letters for windows, offices, trucks, signs. Monograms. Easily applied. Neonite, Akron, Ohio.

**PAINT signs for profit.** Fine lettering fast with Speedway patterns. Unique method. Free samples. Display letters, Box 235-G, New York.

**25th ANNUAL Art Supply Catalog on request.** Ask for yours. Bart Supplies, Dept. S, 915 Marquette, Minneapolis, Minn.

#### CHALK TALK STUNTS

**LAUGH producing program, \$1.00.** Illustrated catalog 10c. Cartoonist Balda Oshkosh, Wisc.

#### CHEMICALS & APPARATUS

**CHEMICALS, Glassware, Apparatus, Instruments.** Leading laboratory supply house offers scientific supplies of professional quality at lowest prices. Send 3c postage for free illustrated catalogue and latest chemical price-list. New York Scientific Supply Co., Dept. 10, 111 E. 22nd St., N. Y. C.

**MAGIC CHEMICAL SUBMARINE,** three issues chemical magazine, book of experiments, new chemical catalog, everything for 25c coin. Clinton Chemical Company, Swedesboro, New Jersey.

**RUBBER latex.** Dime brings literature, twenty experiments. Eastern Latex Labs., Box 53, Dept. S, Canton, Mass.

**CHEMISTRY magazine.** Research, experiments, three months' subscription 15c. Spanier, 100 Forsyth, New York.

**CHEMICALS 5c.** Quantities. Catalog E 5c. Fleischer's Laboratories, Everett, Mass.

**MICROSCOPES, Chemistry, Mineralogy, Telescopes, Binoculars.** Catalog free. Teeko, Evanston, Ill.

#### COMBINATION OFFICE FORMS

**SAVE half—Typewriters, Duplicators, Addressographs, Dictaphones, Check-writers.** Terms—10c per day. 10 day Free Trial. Write, Pruitt, 903 Pruitt Bldg., Chicago.

#### DETECTIVES

**DETECTIVES earn big money.** Make secret investigations. Experience unnecessary. Detective particulars free. Write, George Wagoner, 2640-P Broadway, N. Y.

#### EDUCATIONAL & INSTRUCTION

**GOVERNMENT positions.** Men—Women \$1260-\$2100 to start. Liberal promotions, dependable employment. We have been training students for Civil Service examinations for 42 years. Write for our free catalog, the 136th edition. Columbian Correspondence College, Washington, D. C.

**500,000 used technical and business books.** Sold, rented, exchanged. All subjects. Satisfaction guaranteed. Cash paid for used books. Complete details and illustrated bargain catalog free. Send name. Nelson Co., 3330 Manhattan Bldg., Chicago.

**INCOME from your camera instead of expense.** Low cost home course teaches you to make photographs for magazines, newspapers, advertisers. Tremendous demand. Earn good money wherever you live. Free book. Universal Photographers, Dept. S, 10 W. 33rd St., New York.

**BECOME an optician.** Learn new and paying profession. 4-8 months' course. Day or Evening. Active National Placement Service, co-educational. (Not a correspondence course). Folder on request. School of Mechanical Optics, Dept. 20, 182 Henry Street, Brooklyn, N. Y.

**"UNCLE Sam" 1938 jobs.** Start \$105-\$175 month. Men-Women. Prepare now for next examinations. Common education sufficient. Full particulars—list positions, free. Write today. Franklin Institute, Dept. R49, Rochester, N. Y.

**USED correspondence courses and Educational Books sold or rented.** Inexpensive. Money-back guarantee. Write for Free Catalog listing 4000 Bargains. (Courses bought). Lee Mountain, Pisgah, Ala.

**DEVELOP your mediumistic powers.** Great book teaches you how—\$1.00. Horoscope free with order. Lindhorst Enterprise, 4418PS Clarence, St. Louis, Mo. Send Birthdate.

**IMPROVE your handwriting.** Particulars free. Send dime for signature, six beautiful styles. Expert Penman, 885 Holliston, Pasadena, Calif.

**EMPLOYMENT Guidance, Booklet.** Successful Job Hunting. 25c coin. Employment Counsellors, Box 1283E, Milwaukee, Wisc.

**LEARN tool, die, machinist work, screw-machines.** Booklet "G" free. Allied School, 615-W Lake, Chicago.

#### ELECTRICAL SUPPLIES & EQUIP.

**AUDEL'S handybook of electricity.** For Engineers, Electricians, Students and all interested in Electricity. A quick, simplified, ready reference, giving complete instruction and practical information. Easy to understand. A reliable authority and a handy helper that answers your questions. 1340 pages. 2600 Illustrations. Price \$4.00. Postpaid. Money back if not satisfied. Theo. Audel, Publishers, 49 W. 23 St., New York.

**TELECHRON motors, 1 R.P.M. 2 watt, \$2.00.** Time switch and motor complete \$3.00. Other makes Synchronous motors \$1.50. Time switches \$2.00. 3 digit counters 35 cents. 110 volt Cellanoids 35 cents. Electric Cellanoid valves \$1.50. All motors self-starting. Supply limited. Send cash with order. Eastern Salvage Company, 208 Lafayette St., New York.

**HEADQUARTERS for invaluable electrical information and hard-to-get materials in any quantity.** Send for free catalog. S. W. Duncan, 405 S. Hoyne Ave., Chicago.

#### ENGINES, MOTORS, ETC.

**FIGURE Three Phase Induction Motor windings.** Formula \$1.00. Motor Data, Box 7631, Kansas City, Mo.

#### FARM & FARM LANDS

**40 ACRES, near White River, unimproved; poultry land, \$175; \$5 down, \$5 monthly.** Free list and literature. Hubbard, 269 Grossman Bldg., Kansas City, Kan.

#### FENCING

**FENCING equipment.** Foils, swords, masks, etc. Low prices. Free catalog. Industrial Products, Dept. PS 5, 48 West 48th Street, N. Y.

#### FIELDGLASSES, TELESCOPES & MICROSCOPES

**MICROSCOPES.** Slide making supplies, reagents, and stains. Send for free circular M38. Biological Supply Company, 1176 Mt. Hope Avenue, Rochester, N. Y.

**FREE instructions.** Make powerful astronomical telescope in one evening. Extremely low cost. Atemsco, Box 213R, Flushing, N. Y.

**USED microscopes, binoculars, astronomical telescopes—Bought, sold, repaired.** Send 10c for list. Rasmussen, P.O. Box 294, Amsterdam, N. Y.

**TELESCOPES, Microscopes, Binoculars: 1938 bargain catalog free.** Brownscope Company, 5 West 27th Street, New York.

**BUILD reflecting telescope.** Catalog Free. Instructions 10c. Optical Laboratories, Larchmont, New York.

**TELESCOPES, Binoculars, Microscopes.** Lowest prices. Free catalog. The Hobby Man, Jefferson, Iowa.

**TELESCOPES, Microscopes, Binoculars, Chemistry, Mineralogy.** Catalog free. Teeko, Evanston, Ill.

**MICROSCOPIC staining solutions** list on request. Shumer, 414 W. Broadway, New York City.

#### FOR THE HOME

**KNOCKED-DOWN card tables, maple furniture, silhouette designs, jig-saw blades, pantographs, 10c (refunded) brings illustrated literature.** Aley Crafts, Escanaba, Mich.

#### FOR INVENTORS

**PATENT your idea.** Write immediately for two free books, "Patent Protection" and "When and How to Sell an Invention." Fully explain many interesting points to inventors and illustrate important mechanical principles. With books we also send "Evidence of Invention" form. Prompt service, reasonable fees, thirty-nine years' experience. Avoid risk of delay. Address: Victor J. Evans & Co., Registered Patent Attorneys, 59-E, Victor Building, Washington, D. C.

**OUR free booklet for inventors explains selling facts and buyer locating method that may lead to profitable sale of your patented, unpatented invention.** For free copy write: Invention Reporter, Dept. 12, 11236 So. Fairfield, Chicago.

**HAVE you a sound practical invention for sale, patented or unpatented? If so, write** Chartered Institute of American Inventors, Dept. 3-A, Washington, D. C.

**INVENTIONS quickly commercialized.** Unpatented, protection guaranteed. Pacific Inventors Agency, 2236 Post, San Francisco, Calif.

**INVENTORS: write for free copy** "pointers on promoting inventions." National Service Bureau, Dept. K, St. Louis, Mo.

**INVENTIONS promoted.** Patented, or unpatented. Write Adam Fisher Company, 183 Enright St. Louis, Mo.

#### FORMULAS, PLANS, ETC.

**ANALYSIS.** Research. Newest guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, FA-1142 Sunnyside, Chicago.

**GUARANTEED formulas.** New Fast Sellers. None better. Lowest prices. Catalog free. Kemico, 500 Park Ridge, Ill.

**THAXLY formulas for perfect products.** Accurate analysis assured. Resultful research. Catalog free. P. Thaxly Company, Washington, D. C.

**MONEY making formulas 2c.** Send for list. Address Ben Buller, P. O. Box 211, Henderson, N. C.

**FORMULAS—Latest Money Makers.** Literature Free. E-Belfort, 4042 N. Keeler, Chicago.

#### GAMES, ENTERTAINMENT

**PASTIME for the whole family.** Boys and girls puzzle. 1000 problems, 25 cents, no stamps accepted. Watchmans Puzzle, 105 Brookview Ave., Troy, N. Y.

#### HELP WANTED

**M. M. earned \$267, three weeks,** raising mushrooms in cellar! Exceptional, but your cellar, shed perhaps suitable. We buy crops. Book free. United, 3848 Lincoln Ave., Dept. 240, Chicago.

#### HIGHGRADE SALESMEN

**WANTED—by tool manufacturer,** two salesmen between 30 and 40 years of age. One for Eastern territory and one for Southern territory to call on hardware dealers, machinery dealers, manufacturing plants and schools. Our lathes have been on the market for 31 years, and are nationally advertised. Want salesmen who have had some mechanical experience or technical training. State age, experience, education, etc. South Bend Lathe Works, South Bend, Ind.

**ADVERTISING Book Match Factory** offers you amazing opportunity. We are largest in world selling direct. Big cash comm., low prices. Full—part time. Big repeats. Samples and kit free. Match Corp. of America, Dept. N-5, 6041 Grand, Chicago.

**BIG cash daily; Cash bonuses regularly.** Sell sanforized shirts, ties, hose, underwear direct to wearer. Guaranteed full year. Sensational style and quality features. Sales outfit free. Write today. Dept. PE, Rosecliff-Quaker, 1239 Broadway, New York.

**MAKE more money with Red Comet Automatic Fire Extinguishers.** Low Price. Proved seven years. Splendid sales outfit free. Some good territory open. Exclusive. Write quick. 744 Red Comet Building, Littleton, Colo.

**DISTRIBUTORS—Supply Revolutionary Corn Remedy to stores.** New Sales Plan results in landslide of orders. 150% profit. Exclusive franchise. Reliable Specialty Corp., Buffalo, N. Y.

**STOP job hunting! Start own light manufacturing business.** Profits to 1,500%. Millions need product. Particulars free. Thermo-607, Peoria, Ill.

**MAGIC electric brush.** Retail \$1.50. Your profit 75c. Uses static electricity. No wires, batteries or expense. Carry in your pocket. Unbreakable. Send for sample and particulars. Donald Brush Company, Household Division, Camden, N. J.

**A sure cure for clogged drains.** This tool sells on sight. Get a city and become independent. Silent Valve Co., 3420 Fletcher Drive, Eagle Rock, Calif.

#### HOME CRAFTSMEN

**DESIGN your own furniture.** Our complete course shows you how. Only \$8.50. Invaluable to home craftsmen. Write for descriptive folder. Klok Institute, 430 Lyon, Grand Rapids, Mich.

**20 FULL-SIZED lawn ornament patterns of animals, birds, etc. 25c.** 20 full-sized silhouette patterns of book ends, door stops, etc., 25c. Modern Woodcraft, Saginaw, Mich.

**PLASTICS, brass, aluminum, Dometal, monel, stainless steel, gears, etc.** New catalog now ready 10c coin. Hobby Supply House, Box 2014, Pittsburgh, Pa.

**TYPICAL Mexican designs for making artistic wall plaques.** 20 patterns and instructions 25c. Mexican Arts & Crafts, Box 332, Eagle Pass, Texas.

#### INVENTIONS WANTED

**SMALL inventions wanted by manufacturers.** I'll help you sell your invention. Write for free circular. S. Hull, 7829-M Euclid Avenue, Cleveland, Ohio.

**INVENTIONS—Patented, Unpatented.** Bought outright, royalty. Write, Arellano-Power Co., 1 LaSalle, Chicago.

#### LANGUAGE OUTFITS

**BARGAINS: language sets sold, rented, exchanged, purchased.** Hanfling, T-799 Broadway, N. Y.

#### MACHINERY, TOOLS & SUPPLIES

**MOTOR Speed Reducer ratio 144 to 1, rating up to 1/4 H.P. with friction clutch for overload protection, \$3.95.** Send for free catalog: Compressors, paint sprayers. National Electric Tool Co., 560 Washington, Chicago.

**MICROMETER: \$1.50 postpaid.** Accurate measurements by thousands, 0-1/2 inch with instructions. Also One inch size with adjustable anvil, \$2.65 postpaid. W-Box 3432, Merchandise Mart Chicago.

**KELLOGG Air Compressors, \$6.00.** Electric Refrigerators, \$25.00. Telephones, \$2.50. Taylor, 105 East 102nd St., N. Y.

**PLANS—Crossfeed \$1.00; Milling attach. 75c. info. 10c.** Gottwalt, 43 So. 8, Newark, N. J.

**LATHE metal.** Bench type \$23.75. Circular. Burke Machinery, 1316 Prospect, Toledo, Ohio.

#### MAGIC TRICKS, PUZZLES, JOKER NOVELTIES

**FREE! Magic Catalog 500 tricks.** Amaze, mystify friends. Write today! Lyle Douglas, Station A-1, Dallas, Texas.

**FREE tricks! Join Magicians' Fraternity! Monthly magazine, sample 10c.** International Magicians, Mt. Morris, Ill.

**VENTRILOQUIST figures, instruction and 24 page illustrated catalog 25c.** Frank Marshall, 837 No. State Street, Chicago, Ill.

**WHOOPEE ball, six other novelties.** Samples 25c. Schaffner, Greenwald's, Allentown, Pa.

**LARGE Professional magic catalog, 25c.** Holden, P-220 W. 42nd St., N. Y.

#### MANUFACTURING

**ANALYSIS.** Research. Newest guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, FE-1142 Sunnyside, Chicago.

#### MISCELLANEOUS

**TRIANGLE chart solves triangles by inspection.** Send 25c in silver. P. O. Box 764, Detroit, Mich.

**STANDARD Electric Lamp Insect Killer, \$2.00 up.** Literature free. Sauer Bros., 14822 Foothill Blvd., San Leandro, Calif.

**FREE literature how to locate buried treasure and minerals.** Fisher Laboratories, Palo Alto, Calif.

#### MODELS & MODEL SUPPLIES

**LATEST Catalog.** Locomotives, Gas, steam engines, castings, etc., 25c. Usual refund. Howardco., P-2417 North Ashland, Chicago.

**MODEL racing car kit \$2.95.** Stamp for details. W. Bodell, 36 Myrtle, Battle Creek, Mich.

**RAILWAY models.** Catalog handbook 25c. Walther, 259 E. Erie, Milwaukee.

**ENGINE catalog 20c.** Particulars free. Evraymesco, 28 No. Clinton, Chicago.



## MONEY MAKING OPPORTUNITIES

**MAN** in each town to Plate Auto Parts, Reflectors, Bicycles, Fixtures, Mirrors, by late method. Simple plan of manufacturing at home starts you in good paying business. Free particulars and proofs. Gunmetal Co., Ave. G., Decatur, Ill.

**MAKE** big money in floor surfacing with electric sanding machines. Get into something for yourself and be your own boss. Start with as little as \$75.00. A tried and proven money-maker. Learn to run one in an hour. No previous experience required. Write D. B. Wing, Box R, Central Station, Toledo, Ohio.

**MAGIC** electric brush. Retail \$1.50. Your profit 75c. Uses static electricity. No wires, batteries or expense. Carry in your pocket. Unbreakable. Send for sample and particulars. Donald Brush Company, Household Division, Camden, N. J.

**LIKE** to write? Earn extra Money. Preparing newspaper clippings for publishers. Simple, fascinating, profitable. Stamp brings details. Div. 31, National Press, Hohm Bldg., 6th and Western, Los Angeles, Calif.

**OPERATE** chain world's finest money making vending machines. Sells four products, same time. Instant success! Small capital, profits immediately. P. King, 1233 Chouteau, St. Louis.

**EARN** money in any crowd. Call names of strangers; tell unspoken questions. Professional course mind reading. Spirit writing, etc., \$1.00. Henderson, Box 341, San Bernardino, Calif.

**107 PLANS** for making \$20-\$100 weekly in home or office, business of your own. Full particulars free. Elite Co., 214-A Grand St., N. Y.

**SPARETIME** Mailorder Business. Sell formulas and printed specialties by mail only. Samples 10c. Waldo, Box 266, Dallas, Tex.

**SUCCEED**. With your products. Make—Sell Them. Formulas, Processes. Accurate Analyses. Catalog Free. P. Thaxly Company, Washington, D. C.

**EARN** money collecting reptiles, toads, frogs for us. For particulars send dime Biological Research Laboratories, Dept. 15, Springfield, Missouri.

**ALL** profit mail order business brings dollars daily! Aids millions jobless. Co-operative Service. Department P77 Swan, Buffalo, N. Y.

**EARN** money addressing envelopes, circulars, typing. Information 10c. None free. Ace-PSMA, 322 Empire, Birmingham, Ala.

**"RAISE Earthworms for Profit"** Information Free, Stamp Appreciated. Bureau Zoological Research, 106 P Broadway, Peoria, Ill.

**EARN** money collecting reptiles, toads, frogs for us. For particulars send dime Biological Research Laboratories, Dept. 17, Springfield, Missouri.

**YOU'LL** like resilvering mirrors, auto parts, reflectors, making chipped glass signs. Write Sprinkle, Plater, 920, Marion, Ind.

**\$10.00 DAILY** Stamping names on key checks, outfit furnished. Sample your Name-Address 25c. Bohn Co., Box 86B, Wilkes Barre, Pa.

**"SPARETIME** roads to riches", explains hundreds new easy money-making opportunities. 10c. Lewis Co., 828-P Carpenter, Oak Park, Ill.

**"SUCCESS Beacon"** magazine. Fifty pages moneymaking opportunities, ideas, plans. Dime. Jay, Publishers, 6054-R Kenwood, Chicago.

**107 NEW**, successful home business plans. Century, 1261-PS Broadway, N. Y.

**300 NEW** Canadian Names. Opportunity seekers plan buyers. \$1. 1000 \$5. Parker Publications, Peterboro, Ont., Canada.

**SEMIYEARLY**, forty pages 10c. 6x9. Home Industries, (CD94), Benson, Nebr.

**MAKE** 80c on the \$1.00 by mail. Particulars free. John Deegan, 506 Liberty, Newburgh, N. Y.

**INVENTION** Finance Magazine. 80-N Wall Street, New York. Year subscription 60c. entered upon promise to pay on receipt of first copy.

**90% PROFIT** mailorder opportunities. Literature free. Harvey Teeple, Decatur, Ind.

**AFTERNOONS** Free! \$300 mo.—home! No canv. Expect surprise! Folio, Sta.-D, Los Angeles.

**HOMEWORK** Opportunities Magazine. 10c. Sample 5c. Shumacher, 3503 Hirsch, Chicago.

## MOTION PICTURES & SOUND EQUIPMENT

**LEARN** motion picture Theatre Business. Home-study training; Management, Advertising Projection. Big opportunities. Tenth Year. Free catalog. Give age. Theatre Institute, 375 Washington St., Elmira, N. Y.

**MOVIE** films. Develop yourself. Univex, Eastman, all kinds. Films wholesale. Chemical samples 15c. Lake Camera Exchange, 202, Gary, Ind.

**NEW** complete 8mm popular star movies 60c. 16mm color film sample 50c. Free 16mm, 8mm bargain lists. Home Movies, Box 216S Easton, Pennsylvania.

**8-16MM**, titles, backgrounds, special color effects—6c word down. Cine Shop, 1812 Piedmont, Charleston, W. Va.

**FILM**, for projectors; sample 10c; lists free. Goodwill Company, Jackson, Tenn.

**NEW** and Used 8mm and 16mm films exchanged. Lists Free. Hertwig-261 Reedley, Calif.

## MOTORCYCLES, BICYCLES & SUPPLIES

**RECONDITIONED** Motorcycles. New-used parts for all makes. Authorized Harley-Davidson Dealer. Whitman Motorcycle & Supply Co., 405-9 Southwest Blvd., Kansas City, Mo.

**MOTORCYCLE** bargains, lowest prices, bargain sheets for stamp. Motorcycle accessories. Rochester Harley Davidson Corp., 129 W. Main St., Rochester, N. Y.

**SEND** 15c for Illustrated Used Motorcycle Catalog. Bargains. Largest stock, genuine Indian Parts and Motorcycles. Indian Motorcycle Sales, Kansas City, Mo.

## MUSIC, MUSICAL INSTRUMENTS

**LEARN** professional style piano playing by Ear or Note in two months! Booklet free. Joe Boucher, Box 12, Ottawa, Canada.

**DANCE** orchestrations, 10—\$1.00. Sheetmusic, 25—\$1.00. Silverman Musicmart, 3303 Lawrence, Chicago.

**LEARN** Swing Piano! Postal brings free folder. Christensen, 765 Kimball Hall, Chicago.

**VIOLIN-MAKING** supplies, patterns, instructions, kits. Catalog. Fraser, 2025 Stark, Saginaw, Mich.

**MUSIC** composed to songpoems. Orchestrations arranged. Frank Wildt, Lancaster, Pa.

## OLD GOLD, WATCHES, JEWELRY, PRECIOUS STONES

**HIGHEST** prices for old gold, teeth, watches, jewelry. 100% full cash value mailed day shipment received. Satisfaction guaranteed or articles cheerfully returned. Information free, or ship today. Chicago Gold Smelting Company, 301-H Champlain Bldg., Chicago.

**BANKRUPT** stock watches—diamonds. Save 75%. Stamp brings catalog. P. McGerty-3, Manhattan, Kans.

## PATENT ATTORNEYS

**INVENTORS**: send immediately for your copies of our new free books, "Patent Protection" and "Suggestions on Selling an Invention." Sixty-eight pages of interesting facts. They tell how Patent Laws protect you; kind of sketch or model needed; simple steps to take without cost; how successful inventors have secured financial assistance; show interesting inventions; illustrate important mechanical movements. With book we also send free Evidence of Invention form to help establish date of disclosure. Prompt service, reasonable fees, special deferred payment plan. Strictest secrecy. Thirty-nine years' experience. Highest references. Write us today. The facts in our books are worth money to the man with a good invention. Address: Victor J. Evans & Co., Registered Patent Attorneys, 58-E Victor Building, Washington, D. C.

**INVENTORS**—Time counts. Don't risk delay in patenting your invention. Write for new 48-Page free booklet, "Patent Guide for the Inventor". No charge for preliminary information. Clarence O'Brien and Hyman Berman, Registered Patent Attorneys, 697-D Adams Bldg., Washington, D. C.

**"INVENTOR'S Guidebook"** containing 96 mechanical movements and advice about patenting, selling inventions, also "Record of Invention". Free. Frank B. Ledermann, Patent Attorney-Engineer, 154 Nassau Street, N. Y.

**PATENTS**—trade marks. Preliminary advice, book and disclosure form free. Personal service. Irving L. McCathran, 1050 International Bldg., Washington, D. C., Registered Patent Attorney.

**INVENTORS**—send for free copy my 72-page book on patents. Reasonable terms. Prompt action. Confidential, personal service. L. F. Randolph, Dept. 340-A, Washington, D. C.

**WE** successfully sell inventions, patented and unpatented. Write for proof and tell us what you have for sale. Chartered Institute of American Inventors, Dept. 3-B, Washington, D. C.

**INSTRUCTIONS** "How to Establish Your Rights" and form "Evidence of Conception" sent Free! Lancaster, Allwine & Rommel, 413 Bowen Building, Washington, D. C.

## PERSONAL

**YOUR** past, present and future astrological influences outlined by internationally known astrologers. Complete readings—\$1.00; Test readings—25c. Send complete birth data to: Astrological Center, Astrologer YM, 41 Olvera St., Los Angeles, Calif.

**HYPNOTISM**. Complete 20 Method Course 25c. Western Institute Hypnotism, P-2984 North Ridgeway, Chicago.

**NERVOUSNESS**, nervous fear! Afflicted? Free, interesting information. Investigate! John Englund, Ontonagon, Mich.

**STUTTERING** and stammering corrected at home. Descriptive booklet free. Paul J. Wolfe, Box 52, Pittsburgh, Pa.

**LEARN** ventriloquism, 3c stamp brings particulars. Smith, Room 689, 125 N. Jefferson, Peoria, Ill.

## PHOTO FINISHING

**BE** modern! Get modern service, modern quality, modern prices. Our modern methods give quick service and bright guaranteed neverfade pictures. Roll developed, 16 prints, 25c coin; 16 reprints, 25c. Enlargement coupon. Send next roll or reprint order to Modern Finishers, Box 3537, St. Paul, Minn.

**THE** Photo Mill. Immediate service! No delay! Roll developed, carefully printed and choice of two beautiful 5x7 double weight professional enlargements, one tinted enlargement, or eight reprints—for 25c coin. Reprints 2c each. The Photo Mill, Box 629-10, Minneapolis, Minn.

**MAIL** your rolls to film center of the world. Any 6 or 8 exposure roll developed and printed 25c coin. DeLuxe enlargement coupon free! Photo Finishing Shop, Est. 23 yrs., 500 Genesee Valley Trust Bldg., Rochester, N. Y. "The Camera City."

**PROMPT** service—quality work. Two beautiful double weight Gloss Enlargements, eight guaranteed neverfade prints, each roll 25c. Excel Photo Service, Dubuque, Iowa.

**IDEAL** photos. 25c per roll, finished with round corner prints. To get acquainted! Coupon and snapshot folder free. Ideal Photo. Box 2255, Paterson, N. J.

**AT** Willard's, Box 3535-R, Cleveland Heights, Ohio, you'll get quicker service, beautiful quality. Roll developed, 2 prints each negative 25c. Enlargement coupon. (Trial offer)

**TWO** prints each with every roll developed, 25c. Very finest quality. Reprints 2c each. Brown Photo Company, 2209-32 Lowry, Minneapolis, Minn.

**LARJARGRAPH** reprints: five (5x7 enlargements) 25c; Developing, Printing, Rolls-Films 25c. Ten reprints 25c. Cordinal Photos, Summit, N. J.

**LOOK!** Your choice! Eight prints and two enlargements or 16 prints from each roll, 25c. Quickest service! Modern Studios, LaCrosse, Wis.

**TWENTY** reprints 25c. Roll developed and two prints each, negative 25c. Star Photo Service, Dept. S, 109 North Dearborn, Chicago.

**ROLLS** developed—25c coin. Two 5x7 Double Weight professional enlargements, 8 gloss prints. Club Photo Service, Box 52, LaCrosse, Wis.

**CONFIDENTIAL** developing, two prints, each negative 25c. Royal Photos, 3902 North Sixth, Harrisburg, Pa.

**QUALITY** Velox reprints 3c. Rolls developed and printed 25c. Mead's, Dept. S., Box 811, Station H., Los Angeles, Calif.

**PROMPT** service! Rolls developed, two Velox prints, each negative 25c. Hensch Studios, Harrisburg, Pa.

**ROLLS** developed, 8 prints, 2 enlargements, 25 cents. Mayfair, Box 261, Toledo, Ohio.

**ROLL** developed, finished, 8 prints, 20c. Goodwill Studios, Jackson, Tenn.

**QUALITY**, not quantity! Roll developed, 1c. Prints, 3c each good negative. Economy Photo, Box 157-L, Greensburg, Pa.

## PRINTING, MULTIGRAPHING, MIMEOGRAPHING, GUMMED LABELS

**6x9 CIRCULARS**, letterheads, envelopes, postcards, \$2.95 1000; 5000, \$8.99. Samples, Cuts. Goodprint, Harrisonburg, Va.

**125** letterheads 8 1/2 x 11 and 125 envelopes, \$1.00 postpaid. Benneville, 907 West Roosevelt, Philadelphia.

**DISTINCTIVE** printing, reasonable prices, prompt service, samples. Economic Printing, Leonia, N. J.

**10,000 ASSORTED** colored 6x9 Circulars, \$12.50 prepaid. Blue Grass Press, 209 South Upper, Lexington, Ky.

**1000 ENVELOPES** or Billheads, \$2.50 postpaid. Keystone Press, Andalusia, Pa.

## PRINTING OUTFITS & SUPPLIES

**PRINT** your own cards, stationery, circulars, advertising. Save money. Easy rules furnished. Print for others, big profits. Junior outfit \$9.00, job presses \$11 up. Details free. Kelsey Presses, B-8, Meriden, Conn.

**BUY** your printing equipment from one who started a large printing business with a hand press. Presses, type and supplies. Catalog 3c. Globe Company, Dept. E, 2608 Lawrence Ave., Chicago.

## PROFITABLE OCCUPATIONS

**SOILLESS** plant culture, raise tomatoes, potatoes, flowers, etc., in shallow tank of water containing 21 chemicals. Tomato vines 20 feet, bear for year, 20 pounds per vine, quality better than soil grown. Instructions, formula \$1.00. Purdy's Chemicals, 1852 E. Slauson Ave., Los Angeles.

**GROW** flowers and vegetables without soil. Amazing results in limited space. Any suitable container available. Formula and instructions \$1. Nu-Soils, 42C Sun Building, Jackson, Michigan.

**WANTED**—hear from parties interested gold or silver ores, buried or hidden treasures. Bergman's instrument, \$5.00. Particulars free. Henry Bergman, Box 398-M, Springfield, Missouri.

**RAISE** Angora wool rabbits! Easy, profitable. Wool brings \$3.00 to \$6.00 lb.! Catalog free! Rabbit Farms, Sharon, Washington.

## RADIOS, SUPPLIES & INSTRUCTION

**HOW** would you like to save up to 50% on Nationally advertised Radios, such as Stromberg Carlson, Philco, RCA, Zenith, G. E. etc., for home, farm, auto; over 400 models. Also hundreds of electric appliance items for the home. Write for free giant catalog. Modell's, Dept. 51, Cortlandt St., N. Y. C.

**PLANS** 18 Distance Crystal Sets—SW record 4250 miles, with "Radiobuilder", year—25c. Laboratories, 151-T Liberty, San Francisco.

**"SHORTWAVE"** Crystal set! Illustrated plans 10c. Unicrafter, 4932 Eighth, Phila.

## RARE COINS

**BIG** prices paid for certain wanted coins. 1909 cent \$10.00, some silver dollars \$4000, 1864-1865 Indian head cents \$100.00 each, dimes before 1895 \$600, liberty head nickels before 1914—\$500, encased postage stamps, some large pennies \$2000, half cents—\$275.00, paper money, gold dollars \$1500, foreign coins \$165, some worth \$6000 each. You may have coins for which we pay big premiums. Therefore send 15c today for 1938 big illustrated coin book for certain wanted coins. National Coin Corporation (3), Daytona Beach, Fla.

**\$5.00 TO \$500.00** each paid for hundreds of Old or Odd Coins. Keep all until posted. Send 10 cents for Illustrated Coin Value Book, 4x6. Guaranteed Prices. 31 years in business. Coin Exchange, Box 31, Le Roy, N. Y.

**CERTAIN** large cents worth \$750.00; small cents \$12.00; nickels \$250.00; dimes \$300.00. Send 15c for newest 1938 complete 36 page illustrated buying book. Bob Cohen, Box 3507-A, Cleveland, Ohio.

**COMMEMORATIVE** half dollars, Lincoln, Texas, Oregon, Stone Mountain, Cleveland, \$1.50 each. New illustrated catalogue 25c. Norman Shultz, Salt Lake City, Utah.

**UNITED STATES**, large cent, 2c bronze, 3c nickel and Bargain list, 25c. Eleven dates large cents \$1. George P. Coffin Company, Augusta, Maine.

**THREE** Foreign Coins and price list 10c. Joseph Coffin, 1182 Broadway, New York.

**10 LARGE** cents \$1.15. Radtke, 56 Dale, Rochester, N. Y.

## RAZOR BLADES

**HUNDRED** Finest Razor Blades \$1.00. Dime brings trial package. Agents wanted. Factory, 1105 North Street, Oil City, Pa.

**100 FINEST** quality, double edge, blue steel razor blades \$1.00 postpaid. Richard Ashton, 63 Basswood, Lawrence, Mass.

## RUBBER STAMPS, OFFICE SUPPLIES

**NEW** \$3.75 automatic adding machine. Fully guaranteed. Bassett, Box 302E, Altadena, Calif.

## SCIENTIFIC INFORMATION

**AMAZING** 284-page book of fascinating scientific information: Pocket Guide to Science answers questions about the earth, stars, planets, the human body and mind, animals, electricity, radio, chemistry. Explains in



simple language, the marvelous reasons for the miracles of the universe, of life, science, physics, evolution, geology, magnetism, motion. With this book handy you'll quickly gain a working knowledge of all these subjects and many more. Eleven complete sections—284 pages, cloth bound. Over half a million copies sold at higher prices—now send only 25¢ per copy, book will be mailed postpaid, while few remaining last. Eugene Watson, Dept. C58, 353 Fourth Ave., N. Y.

#### SONGWRITERS

SONG poems wanted to be set to music. Free examination. Send poems to McNeil, Bachelor of Music, 4153-PS South Van Ness, Los Angeles, Calif.

SONGWRITERS—get "How to Write Songs" by famous Broadway composer and free Rhyming Dictionary. Songwriters Institute, 1234-J Broadway, New York.

SONGWRITERS: Send best poem today for exceptional offer. Richard Brothers, 146 Woods Building, Chicago.

MUSIC composed to words. Rhyming pamphlet free. Phonograph recording of song free. Send Poem. Keenan, 259 Beach St., Bridgeport, Conn.

WANTED original poems, songs, for immediate consideration. Send poems to Columbian Music Publishers Ltd., Dept. 96, Toronto, Can.

SONGWRITERS, Verse or music. Brilliant opportunity. Write immediately. Vanburen, B40, Röckhaven, Ky.

SONGWRITERS! Marvelous opportunity. Investigate. Standard Song Service, 1412 Great Northern Bldg., Chicago.

SONGWRITERS wanted, write for free book, 50-50 plan, Song Bureau, Dept. L, Salem, Ind.

#### SPORTING GOODS, GUNS, FISHING TACKLE, ARCHERY

FISHERMAN: Send a dime and your dealer's name for a set of three trout, bass, or pan fish spinners together with our list of material for constructing your own lures that will catch fish. Your money refunded if not satisfied. Spinner Specialties, Lewiston, Idaho.

RIFLES, shotguns, S&W, Colts, Target Pistols, Air Rifles, Hunting Knives, Binoculars, Telescopes, Police Goods, Badges, Holsters, etc. Bargain catalog 3c. Lee Sales (Dept. PS), 35 West 32nd St., N. Y.

SUBSCRIBE now to the leading archery magazine of America. Covers all phases of archery. \$1.00 the year. Send ten cents for sample copy. American Bowman-Review, Albany, Ore.

HUDSON Bay blankets, Indian pack baskets, camp stoves, knives, compasses, outdoor equipment. Free catalog. Howe Fur Co., Box PS, Coopers Mills, Maine.

ROD holders for bank and boat fishing, folding. Carry in tackle box or pocket. Send \$1.00 each. Howard Presler, 507 Patterson St., Carey, Ohio.

NATIONALLY known and advertised fishing tackle at bargain prices. Catalogue free. Tackle Store, Sac City, Iowa.

RACKET stringers—Use the patented Whiteside string tensioner for best results. Box 83, University Station, Syracuse, N. Y.

HEADQUARTERS for bows and arrows, materials and supplies. Catalogue Free. Instruction Book 50c. Archery, 617 South State, Chicago.

DETAILED instructions 60c. Make bows, arrows, targets. Hobson, Salem, Ore.

BOWS, Arrows, raw materials. Lowest prices. Lloyd Morrison, Waldport, Ore.

AIR rifle shot. Send name for 100 free. W. R. Benjamin Co., Granite City, Ill.

#### STAMP COLLECTING

STAMP outfit free! Tannou Touva Landscape Triangle; new Tunafish Triangle from Costa Rica; amazing packet North Borneo (Jungle Scene), Georgia (Dead Country!), Sudan (Desert Scene), a set of the world's smallest Stamps, and a Watermark Detector, all absolutely free to approval applicants sending 3c postage! Write today. Midwood Stamp Company, Dept. 8R, Midwood Station, Brooklyn, N. Y.

PRODIGIOUS gift! Fantastic Indochina, German State, Savage Somalicoast, Perak, Selangor, Negri Sembilan, Bicolored Banana Airmail, Siberia—Absolutely free with Approvals! Postage 3c. Saxon Company, Dept. 19, Albee Bldg., Brooklyn, N. Y.

DIAMOND airpost commemorative issue complete; proletariat portraits and famous Dragon stamp with 117 additional, only 10c. Friendly Philatelists, Box 4428S, Philadelphia, Pa.

EARLY U. S. Send for list. M. Place, Harding, Mass.

1897 GRANDE Comore, Turks Caicos, Cayman Islands, genuine Baden, Western Samoa, etc. Everything 3c with approvals. Viking, 1-P Hanson Place, Brooklyn, N. Y.

RARE airmail, scarce camel stamps. Chance to join big stamp club. Mammoth stamp packet. All for only 5c. Approvals. Atlas Stamps, Dept. A, Little Rock, Ark.

4½ TRIANGLES! Guatemala Bisect (diagonal half-stamp); beautiful Liberia, three additional triangles, 27 other stamps, 5c. Abell Co., 1818-H St. Paul, Baltimore, Md.

DIAMOND shaped stamp. Liberia gunboat triangle two other triangles, silver jubilee, 27 others, 5c. Crowder Co. 127-H E. North, Baltimore, Md.

BOY Scout Jamboree set. Minerva Triangle from Netherlands, Complete Costa Rica Diamond Shaped Airmails, 10c with approvals, Reyco, Box 5197, Los Angeles.

140 ALGERIA, Congo, Ecuador, Hyderabad, Palestine, Mongolia, Eritrea, Siam, Persia, etc., 10c. Lufbery, Middletown, Conn.

FREE: 50 stamps, Manchukuo, etc. Postage 1c, album 3c. Bullard, 268D Northampton, Boston, Mass.

EARN cash—stamps. Sell my approval books. Nickel packets. Eliston, 2841 West 37th, Brooklyn, N. Y.

LIBERIA snake triangle, giant Spanish triangle, 50 other stamps, 5c. Wright Co., 2527-H, Guilford, Baltimore, Md.

ECUADOR Constitution, Boy Scout World Jamboree, Diamond Air Mail, Viking Ship, Devils Island, 5c approval applicants. Xcel Company, Edwardsville, Ill.

FREE. Packet to approval applicants. Schramm, 1489 East 19th Street, Brooklyn, N. Y.

BETTER approvals. Reference please. Fred Lobdell, 625 South 18th, Salem, Oregon.

FREE—\$2.00 and 15 other United States. Mailing 3c. Foreign approvals. W. Clatworthy, Upland, Calif.

UNITED STATES commemoratives, 25 different 20c. Goldsmith, Box 200, Chicago.

FIJI, Borneo, 23 other British colonial 3c. Approvals. Porter, Box 863, Springfield, Ohio.

100 ALL different Portugal 25c. LC. Trading Company, Box 38, Belle Rose, N. Y.

DESTROYED Zeppelin Hindenburg scarce, 5c approvals. Frenchco, Phoenix Building, Cleveland.

UNITED STATES, 100 different 40c. Pillault, 528 Broadway, Oakland, Calif.

HINDENBURG Zeppelin (catalogs 35c) 5c with approvals. Laurence Shultes, Berne, N. Y.

#### WANTED—MISCELLANEOUS

CASH for used Microscopes, Binoculars, Cameras, Slide Rules, Drawing Sets, Surveying, Scientific Instruments, Mechanical and Electrical Hand Tools. Highest prices paid day shipment received. Satisfaction guaranteed or shipment promptly returned. Elman's, 2300-PS, Van Buren, Chicago.

#### WELDING, SOLDERING

HOME-MADE Arc-Welder from North-East (Dodge) 12 volt automobile generators. Requires field coil and brush changes for 40 volts D.C. Remote control 25-125 amperes, dual 25-200. New method designed for beginners, actual welding views, real facts, over 3,000 instructive words. Certified plans \$1.00, C.O.D. \$1.12, airmail 12c extra. Welders Club of America, WB-3432 M-Mart, Chicago. Special: limited quantity, Dodge 12 volt used generators with certified plans, \$5.00 F.O.B. Chicago. Special: send ad with above orders for extra plans, "How to build Dodge Arc-Welder without rewinding."

75-200 AMPERE arc welder from Dodge generator. Complete plans and valuable catalog 35c. 100 other generator changes. LeJay Manufacturing, 223 LeJay Bldg., Minneapolis, Minn.

IF you want a real A.C. Electric Arc-welder not a toy build from our plans. \$1.00 Cash or Money Order. Box 48, Fairview, N. J.

ARC welder bargains. Used, trade-ins, rentals, demonstrators. Write for price list. The Lincoln Electric Co., Room 22, Cleveland, Ohio.

#### WIND ELECTRIC PLANTS

FREE electricity from wind. Build your own Windcharger. Cost 98c for material plus used car generator. Drawings—instructions 10c. Wesco, Minneapolis, Minn.

BUILD wind light plant. We show you how. Complete plans and valuable catalog 10c. Wind plant parts, welders, electric fences. LeJay Mfg., 623 LeJay Bldg., Minneapolis, Minn.

## Scientist Says Heads Grow Through Life

RECORDS he kept for forty years of the sizes of the hats he bought and wore have convinced Sir Flinders Petrie, eighty-four-year-old British archaeologist, that his head diameter increased steadily, even past middle age. The British scientist made known his findings in a letter to the Smithsonian Institution, at Washington, D.C., in confirmation of a theory recently advanced

by Dr. Ales Hrdlicka that the human head—and presumably the brain—grows throughout adult life. Sir Flinders reported that when he was twenty he wore a size 6½ hat. Ten years later a size 7 was too small. At forty, he bought size 7¼, and at fifty, a size 7½. Since then, he has had difficulty wearing any standard-size hat, the scientist declares.

## Atom-Smashing Creates New Atomic Forms

TRANSMUTATION of the elements, or "atom-smashing," has added more than 220 kinds of atoms to the basic 250 found in nature, according to Dr. K. K. Darrow of the Bell Telephone Laboratories. Moreover, only two chemical elements have resisted scientific efforts to break them down into different

atomic structures. Before the days of atom-smashing, the world consisted of 250 kinds of atoms, of which about forty were unstable like radium, which spontaneously disintegrates into other forms. In the last four years, scientists produced almost all the unstable forms capable of lasting a few seconds.

## Wartime Power Plants Are Made Bombproof

BOMBPROOF power plants to serve chemical and munitions factories in wartime in the event that the regular power plants are destroyed, are under construction in several European countries. Although the plants are not intended for immediate use, they are to

be maintained in good condition in readiness for an emergency. Set in tunnels driven into the rock faces of cliffs, the plants may even have automatic controls to start them if the outdoor plants are put out of commission by an enemy's shells.

## Monastery Secrets

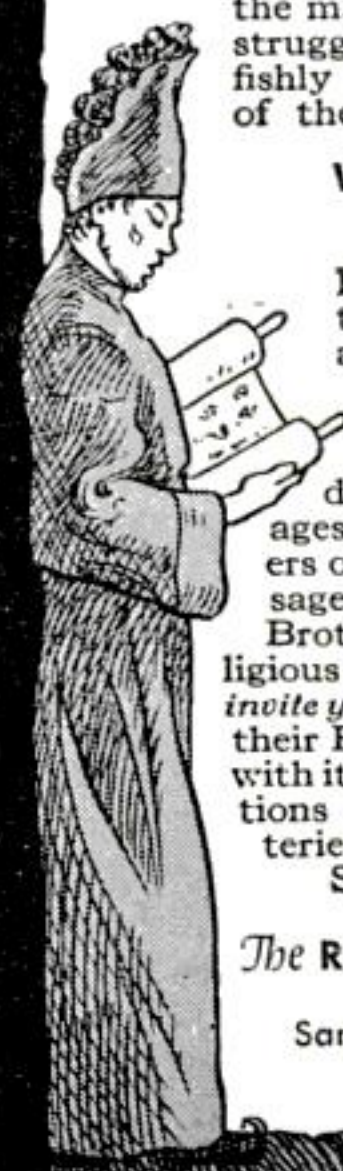
### ... THE FORBIDDEN KNOWLEDGE OF TIBET

What strange secrets of nature are locked within the mountain fastness of Tibet? What control over the forces of the Universe do these cloistered sages exercise? For centuries the world has sought to know the source of their power—to learn their mastery of life, and their faculty for overcoming problems with which the masses of mankind still struggle. Have they selfishly deprived humanity of these rare teachings?

#### WRITE FOR THIS FREE BOOK

Like the streams that trickle from the Himalayan heights to the plateaus below, the great truths of these brotherhoods have descended through the ages. One of the preservers of this wisdom of the sages is the Rosicrucian Brotherhood (not a religious organization). They invite you to write today for their FREE Sealed Book, with its amazing revelations about these mysteries of life. Address: Scribe O. W. D.

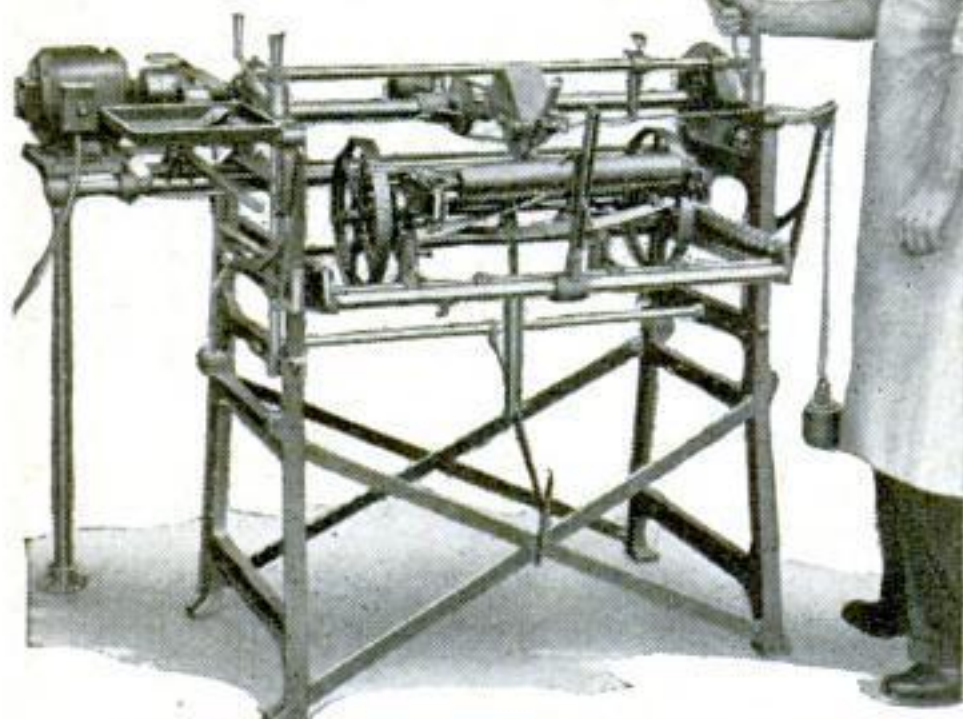
The ROSICRUCIANS  
AMORC  
San Jose, Calif.  
U. S. A.





## Cash FOR SPARE TIME!

MAKE \$25 TO \$30  
PER WEEK AT HOME  
IN YOUR SPARE TIME



### THE IDEAL LAWNMOWER SHARPENER

Like magic, the Ideal Lawnmower Sharpener makes old, dull, half worn-out mowers cut like new. Simply set the mower in the Ideal and the machine does the rest. Sharpens any lawnmower to a perfect edge in 15 to 20 minutes... usual charge \$1.00 to \$1.50. Attach to light socket. Start in your basement or garage. Work in spare time. Attachments furnished for grinding skates, grass shears, hedge shears, sickles, scythes, axes, etc. FREE CATALOG tells complete story.

### WHAT THESE MEN DID... YOU CAN DO

Remember, no experience is necessary. Most men sharpen lawnmowers in spare time only. J. B. Van Dien writes: "Some weeks I earned \$40 a week with my Ideal just as a side line." George Seltel writes: "I have sharpened over 500 mowers and every customer is well pleased." A. M. Larsen writes: "I average 9 mowers a day." Roy F. Stier says: "I live in a town of 500 and to-date have sharpened 200 mowers at \$1.25." Edward A. Mynderse writes: "Have sharpened around 500 mowers this season." Nick Baltes says: "Last summer I sharpened 200 mowers at \$1.00 each." Bucher Battery Co. writes: "We sharpened over 600 mowers last year at \$1.50 each."

### FREE BOOK Shows How!

Right now, before you forget it, send for a copy of our FREE BOOK, "How To Make \$25 to \$30 per week in SPARE TIME."

SEND POST CARD TO

THE FATE-ROOT-HEATH CO.  
318 Bell St. Plymouth, Ohio



## CUT ME OUT

Cut me out, paste me on a postcard and mail to Popular Science Monthly, Dept. 58, 353 Fourth Ave., New York, N. Y. I'll bring you complete supplies and instructions on how to make easily several dollars a week in your spare time.

## Floating Shift



## ONLY CORONA HAS IT!

Ask any "big machine" typist if Floating Shift doesn't save work and wear, improve alignment, add speed! Then look at all the other Corona features... Touch Selector, Speed Booster, All-around Frame, etc. Match Corona against all comers. Easy to use... easy to pay for... as little as \$1.00 a week. Free case and touch chart.

### MAIL THIS COUPON!

L. C. SMITH & CORONA TYPEWRITERS INC., Desk 5,  
721 E. Washington Street, Syracuse, N. Y.  
I'm thinking of buying a Corona. Send free descriptive booklet and terms.

Name \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_



## Packaged Materials FOR MAKING MODELS OF HISTORIC CRAFT

HISTORY is closely identified with the sea; man is always devising new ways to travel by water. That is why building ship models is such a fascinating hobby—there are so many famous craft that can be reproduced. For the convenience of readers we have prepared construction kits for making twenty-eight different models—models ranging from a stately and decorative galleon to the U. S. Navy destroyer *Preston*, pictured above. There are simplified models for the beginner and more difficult models for the advanced craftsman.

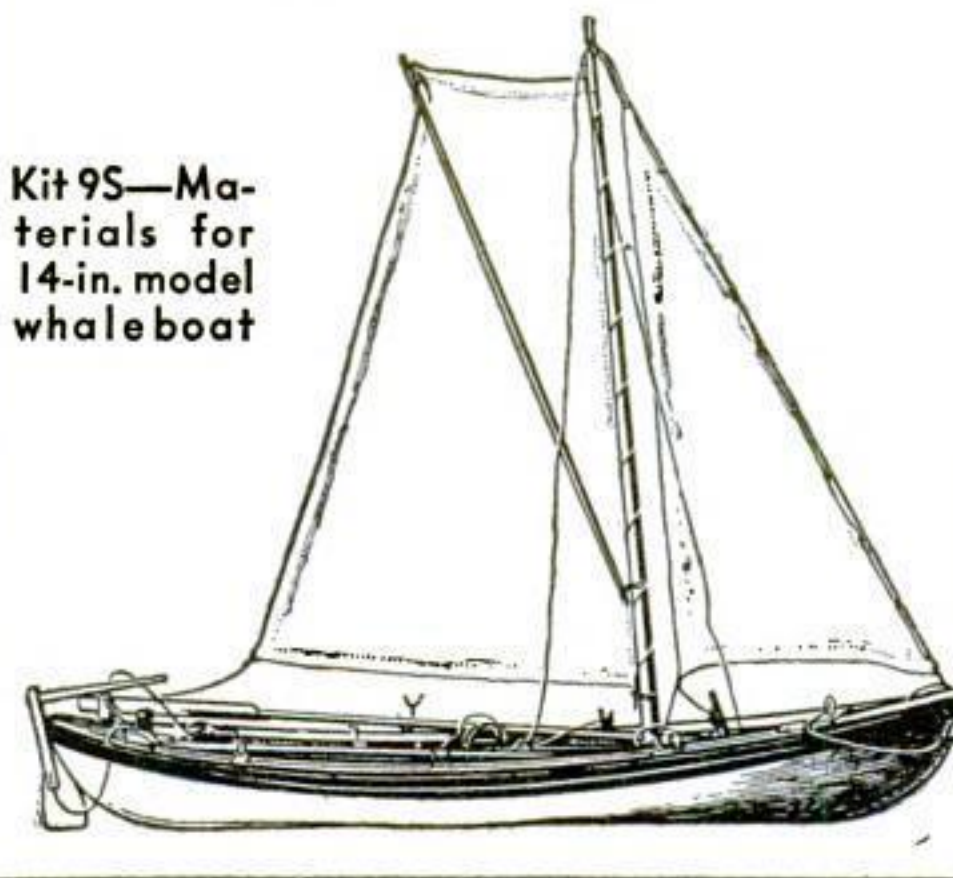
Each kit in the following list contains all the raw materials for making the model named. A certain amount of preliminary shaping has been done on most of the hulls or hull lifts, and the other materials are of such sizes and shapes as to make it easiest for you to transform them into their final form. Full-size blueprints, as well as any necessary instructions, are included.

### STANDARD SHIP MODEL KITS

- A. Whaling ship *Wanderer*, 20½-in. hull, 27½ in. over all.....\$7.40\*
- D. Spanish galleon, 24-in. hull, 30 in. over all..... 6.95\*
- E. Battleship U.S.S. *Texas*, 3-ft..... 7.45\*
- G. Elizabethan galleon *Revenge*, 25-in. hull, 28 in. over all..... 7.25\*
- L. Farragut's flagship *Hartford*, steam-and-sail sloop-of-war, 33½-in. hull, 41 in. over all..... 8.45\*
- Q. Privateer *Swallow*, 12½-in hull, 20 in. over all..... 4.95†
- V. Clipper *Sovereign of the Seas*, 20½-in. hull, 26 in. over all..... 4.95†

(Continued on page 23)

Kit 9S—Ma-  
terials for  
14-in. model  
whaleboat



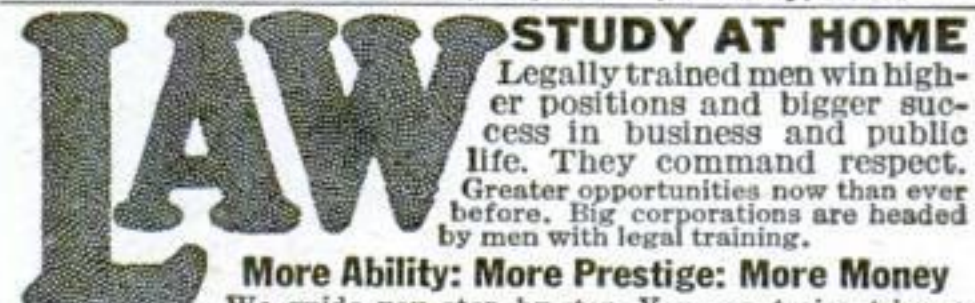
## CURVED SHOCK-PROOF WATCH INCLUDED FREE OF EXTRA CHARGE



Richly Jeweled for Accuracy  
CURVED, "Shockproof" genuine GOLD PLATE front watch with all the color and charm of natural yellow gold. ACCURACY guaranteed by \$1,000,000 FACTORY. Looks like \$35. YOU will like this Gladiator ring and its double head set in LIFETIME sterling 925-1000 pure—decorated in gold—it is yours for only \$5, and watch is then included FREE!  
NO CHARGE FOR CREDIT!  
No red tape. We'll ship at once. Make 2 monthly \$2.50 payments. 10 DAY FREE TRIAL. Simply enclose 10 cents for packing, etc. WE TRUST YOU—your package comes (postage paid to your door) by RETURN MAIL.  
GOLD STANDARD WATCH CO., Dept. C-835, Newton, Mass.



A WIRELESS Pocket TUBELESS BATTERYLESS RADIO  
WORLD'S SMALLEST REAL PERFORMING RADIO  
Amazing midjet radio is complete in one unit—weighs only 3 ozs. Receives stations with clear beautiful tone. Not to be confused with cheaply made imitations. MANUFACTURED BY THE ORIGINATORS OF THE POCKET RADIO. Mechanical Patent No. 2,074,887 covers complete construction. Programs come directly from front of radio. Uses self-contained "Speakaphone" unit which gives superior performance. NOT A TOY. Absolutely complete with instructions for use in homes, hotels, boats, etc. TAKES ONLY A SECOND TO CONNECT. No hook-ups to any current. THOUSANDS OF SATISFIED OWNERS in all parts of the world report wonderful service with their sets. Two color cabinets in six colors. SEND NO MONEY!  
Pay postman only \$2.99 plus postage on arrival or send \$2.99 (Check, M.O., Cash) and yours will be sent postpaid. GUARANTEED. A most unusual value. ORDER NOW!  
TINYTONE RADIO CORP., Dept. PS-5, Kearney, Nebr.



LAW STUDY AT HOME  
Legally trained men win higher positions and bigger success in business and public life. They command respect. Greater opportunities now than ever before. Big corporations are headed by men with legal training.  
More Ability: More Prestige: More Money  
We guide you step by step. You can train at home during spare time. Degree of LL. B. conferred. Successful graduates in every section of the United States. We furnish all text material, including fourteen-volume Law Library. Low cost, easy terms. Get our valuable 64-page "Law Training for Leadership" and "Evidence" books FREE. Send for them NOW.  
LASALLE EXTENSION, Dept. 583-L Chicago

## Re-String Rackets at Home EARN MONEY



It's pleasant, profitable work. No experience or skill required. Easy to Learn. Full line of guaranteed stringing tools, frames, gut and silk strings. Highest quality. Write for details.  
Write for our 1938 Catalog and Instruction Book.  
W. A. BICKEL & CO. Dept. F-5 137 N. Marion, Oak Park, Ill.



## Want a Career in photography?

We give you personalized training. Commercial, News, Portrait, Advertising, Candid or Motion Picture Photography. Big money-making opportunities. Or learn for pleasure. Personal Attendance and Home Study courses. 28th year. Write for Free booklet.  
NEW YORK INSTITUTE OF PHOTOGRAPHY  
10 West 33 St. (Dept. 5) New York City



EARN MONEY at Home  
Make delicious, new "NON-GREASY" Potato Chips at low cost. We furnish equipment and instructions. Potatoes plentiful and cheap. Groceries, markets, restaurants, taverns do the retailing for you. Profit large—unusually so. You can start this money-making business on a "next to nothing" outlay of cash. Write for Potato Chip Booklet.  
LONG-EAKINS CO.  
547-S High St. Springfield, Ohio



VOICE  
100% Improvement Guaranteed  
We build, strengthen the vocal organs—not with singing lessons—but by fundamentally sound and scientifically correct silent exercises... and absolutely guarantee to improve any singing or speaking voice at least 100%... Write for wonderful voice book—sent free. Learn WHY you can now have the voice you want. No literature sent to anyone under 17 unless signed by parent.  
PERFECT VOICE INSTITUTE, Studio 1365  
64 E. Lake St., Chicago



## HOME STUDY

Home Study Courses leading to Degrees in Arts and Sciences; Philosophy; Education; Writing; Psychology; Chemistry; Theology; Law; Agriculture; Business; Accounting; Sales; Advertising; Public Speaking; Electrical, Civil, Diesel, Mechanical, Architectural, Aeronautical, Drafting, Radio, Air Conditioning, Refrigeration, Automotive, Highway, Mining, Steam, Petroleum, Industrial and Chemical Engineering.

McKinley-Roosevelt Graduate College  
4202 Clarendon Ave., Chicago, Illinois, U.S.A.

## LES Correspondence Courses in RADIO and ELECTRICAL ENGINEERING

Get good grasp of wide electrical field. Prepare yourself, at Low Cost, for secure future. Modern, simplified, you can understand quickly. Extra fine course in radio, public address, photo-electric work. Trains you to be super-service man, real vacuum tube technician. Experiments furnished. Diploma on completion. Tuition, \$25, either course. Deferred payment plan. **FREE** Get copies of school catalogs, student magazines, complete details. **SEND NOW!**

Lincoln Engineering School, Box 931-80, Lincoln, Nebr.

## Earn Cash at Home!



We paid M. M. \$1174 for exceptional "cellar crop" SNOW-KING mushrooms! Big free picture book tells if your cellar, shed, barn suitable. We furnish materials, buy all crops through our 25 branches. Write today for "Guaranteed Success Plan" backed by \$5000 bond. Est. 1908.

UNITED MUSHROOM CO.  
3848 Lincoln Ave., Dept. 341, Chicago.

## PLASTEX

The Plastex Industry needs manufacturers on small scale and for big production of Lamp and Clock Stands, Art Goods & Novelties in Plastex and Marble imitation. Experience unnecessary. 1/2c material makes regular 10c store sellers. Rubber moulds furnished for speed production. Small investment brings big returns. Ambitious men have chance for real prosperity. Our free booklet will interest and benefit you. Plastex Industries, Dept. 2, 1085 Washington Avenue, New York, N. Y.

## RAISE GIANT FROGS

**FREE BOOK** Good Prices Year Round! Nation-wide markets waiting for all you can ship. Sell to us also. **WE BUY!** Get ready now for next season. Breeder lays 20,000 eggs yearly. Start with a small pond, marsh, lowland. **Free book** shows sketch. Men & Women starting in every state and Canada. See what others are doing. **Send no money!** Just write your name and address on a postcard and get our special offer to beginners. Write today. American Frog Canning Co. (Dept. 144-E) New Orleans, La.

## DO YOU OWN A RAILROAD?

Here at last is a brand new and complete handbook for the Model Railway enthusiast. Shows you how to save real money building and laying your own track, making an automatic signal system, constructing bridges, culverts, tunnels, stations, semaphores, water tanks, coaling trestles, roundhouses, turntables, crossing gates, switches, etc. The detailed instructions and diagrams in this great book make it easy.

### EVERY MODEL RAILWAY ENTHUSIAST NEEDS THIS NEW BOOK

Tells you how to utilize every bit of available space in laying out your system. How to turn out smoke stacks, fire boxes, boilers, and wheels, in your own shop. Complete, easy-to-follow instructions for building a box car, gondola, refrigerator, tank, hopper, caboose, day coach, pullman, baggage, and observation car. Complete plans, specifications, instructions, and scale blueprint for building the popular Atlantic type locomotive. Send only \$2.00 for your copy of Model Railways or we will ship C. O. D. plus a few cents postage. Satisfaction guaranteed or money back. Address

Popular Science Monthly, Dept. 58  
353 Fourth Ave. New York, N. Y.

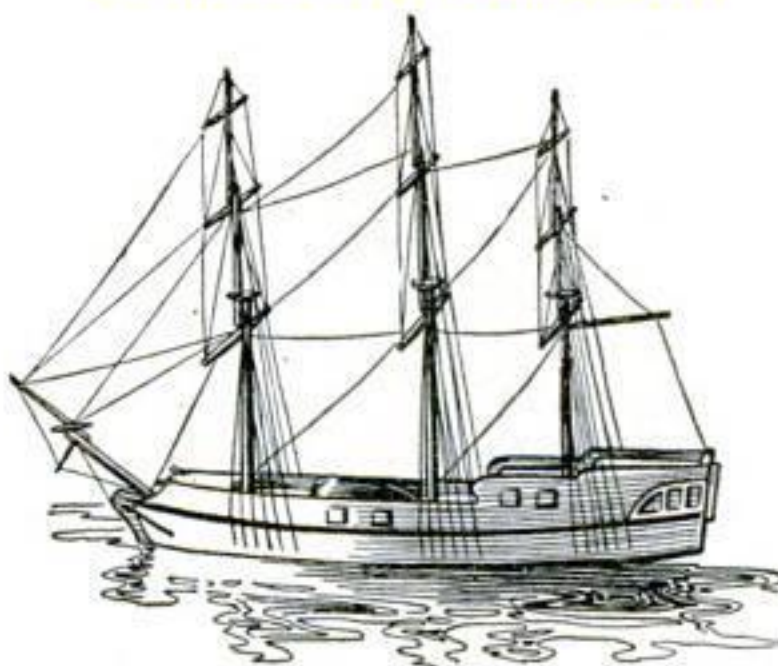
## The HOME CHEMIST

A new book which shows how to set up and operate an inexpensive home laboratory with odds and ends of material available in every home. Many thrilling, practical, useful experiments and tests, entertaining, instructive, valuable, pointing the way to research and new discoveries. Many diagrams and illustrations. Full cloth bound \$1.00.

POPULAR SCIENCE MONTHLY, Dept. 58  
353 Fourth Ave. New York, N. Y.

## Kits for Making Models

(Continued from page 22)



Kit U—"Hispaniola" of "Treasure Island"

- Y. Trading schooner, 17 1/2-in hull, 22 1/2 in. over all..... 4.90†
- 2S. U. S. Navy destroyer *Preston*, 31 1/2-in. hull..... 5.95\*
- 3S. *Constitution* ("Old Ironsides"), 21-in. hull, 31 in. over all..... 6.50\*
- 4S. Clipper ship *Great Republic*, 31 1/2-in. hull, 42 in. over all..... 8.40\*
- 5S. Coast Guard patrol boat of new 165-ft. class, 20 5/8-in. hull..... 4.95\*
- 6S. Brig *Malek Adhel*, 1/4-in. scale, 20-in. hull, 33 in. over all, frame-and-plank construction.. 9.75†
- 8S. Fishing Schooner *Bluenose*, 17 1/2-in. hull, 22 in. over all..... 4.95†
- 9S. Whaleboat, 14 in. long; partly shaped hull and raw materials for making all equipment..... 2.75†
- 10S. Confederate raider *Alabama*; steam sloop, bark rigged; 3/32-in. scale; 21 1/2-in. hull, 28 in. over all ..... 8.20\*

### MODEL-OF-THE-MONTH KITS

- M. Aircraft carrier *Saratoga*, 18-in. 1.00
- N. Four U.S. destroyers, each 6 1/4-in. .... .75
- R. U. S. cruiser *Tuscaloosa*, 11 3/4-in. .... 1.00
- U. *Hispaniola*, the ship in "Treasure Island," 7-in..... .50
- Z. H.M.S. *Bounty*, 11 1/2-in..... 1.50
- 2M. Ocean freighter, 14-in..... 1.50
- 3M. Yacht *Nourmahal*, 8 1/8-in..... 1.00
- 4M. Oil tanker, 14-in..... 1.50
- 5M. Liner *President Lincoln*, 14 3/4-in. 1.50

### SIMPLIFIED SHIP MODEL KITS

- F. Liner S.S. *Manhattan*, 12-in..... 1.00
- H. Cruiser U.S.S. *Indianapolis*, 12-in. .... 1.50
- J. Clipper ship *Sea Witch*, 13-in... 1.50

(Continued on page 24)



Our new model of the famous Confederate raider "Alabama" is built with Kit 10S

# THOU MARVEL THEIR BODIES

As these Women  
**IRONIZED YEAST**  
Add 10-25 lbs.

**SCIENTISTS** have discovered that thousands of people are thin and run-down only because they don't get enough Vitamin B and iron in their daily food. Without these vital elements you may lack appetite and not get the most body-building good out of what you eat.

Once these elements are properly supplied, as they now are in these amazing new Ironized Yeast tablets, the improvement that comes in a short time is often astonishing. Thousands report wonderful new pep, gains of 10 to 25 pounds in a few weeks—complexions naturally clear and fresh—a new natural attractiveness that wins friends everywhere.



Posed

### Why they build

Food chemists have found that of marvelous health-building rich yeast used in making

Now by a new and costly English ale yeast is concentrated to make just one pound of it many times more potent than ordinary yeast. Then iron and pasteurized ale yeast

The result is these new tablets, which thousands have needed their elements hauled in building, health-building discovery

### Try it without risk

Get Ironized Yeast tablets from you with the very first package you don't and get more benefit from your food better, with more strength and pep—proven that Ironized Yeast will give you normally attractive flesh you need—package will be promptly refunded.

### Special offer

To start thousands building up their we make this valuable special offer: age of Ironized Yeast tablets a seal on the box and mail it to of this paragraph. We will send new book on health, "New Body." Remember, rest first package—or money back. Ironized Yeast Dept. 455, Atlanta



IMP





## Easy as A-B-C Your Own Teacher

by wonderful improved method. Simple as A-B-C lessons consist of real selections. Each of these delightfully easy your list. You read real notes, music. Method is so thorough students are band and orchestra

**Pick Your Course**  
Piano Guitar  
Violin Saxophone  
Organ Mandolin  
Cornet Ukulele  
Trombone Harp  
Piccolo Clarinet  
Flute Cello  
Hawaiian Steel  
Trumpet  
Piano Accordion  
Plain Accordion  
Voice and Speech  
Culture  
Harmony and  
Composition  
Drums and Traps

## RADIO EXPERT -Make Good Money

come in spare time make \$30, \$50, \$5, \$10, \$15 a week extra in. Illustrated 64-page book points also how you can learn to be a practical 50-50 method of train- is included. Money Back Agree- today. Get book FREE.

Dept. 8EP3,  
Washington, D. C.  
gation, your 64-page book "Rich  
FREE. (Please write plainly.)  
Age.....  
State.....

## Promoted

In business over 30  
description or model,  
Complete facilities.

## COMPANY St. Louis, Mo.

## ITORS OUR IDEAS BOOK

AIN A PATENT,  
mer Member of the  
(1922-24) of the U.S.  
you want to profit by  
ould take steps to apply for a U. S.  
our first step is to get this Free Book.  
lustrated book contains valuable in-  
uld have. It tells you fully how to  
your idea in the quickest way. With  
ou will also receive a "Record of In-  
which you can easily record your idea.  
nfidential Service: Your case will be  
d only by a Registered Patent At-  
o a Former Member of the Examining  
S. Patent Office. All communications  
onfidential.

TODAY for FREE PATENT BOOK,  
F INVENTION Form.

## MILLER TENT ATTORNEY CORPS U. S. PATENT OFFICE

Floor, Dept. 58-C, New York  
T. 58-C, WASHINGTON, D. C.  
e Book, "How to Obtain a Pat-  
ention Form."

## Kits for Making Models

(Continued from page 23)

One of the six Scotties, all different, that can be made from our special whittling kit No. 8 in the list below



### MISCELLANEOUS

- No. 4. Solid mahogany book trough 22½ in. long, 9½ in. wide, and 24¾ in. high over all. Ready to assemble, with finishes..... 5.30\*
- No. 5. Solid rock maple hanging wall rack with one drawer, 19½ in. wide, 33¾ in. high. Ready to assemble and stain included..... 5.75\*
- No. 7. Whittling kit with two shaped blocks for making sea captain 5½ in. high..... 1.50
- No. 8. Whittling kit for six different Scotties. Each is 2 by 2¼ in., sawed to shape..... 1.00



The galleon "Revenge" is made with Kit G

- No. 10. Copycraft whittling kit for making one of several Hobo Hank novelties. Includes master model 5¾ in. high..... 1.50

NOTE: If you live west of the Mississippi River or in Canada, add 50 cents to all prices marked with an asterisk (\*) and 25 cents to all prices marked with a dagger (†).

Popular Science Monthly, Dept. 58-A  
353 Fourth Avenue, New York, N. Y.

Please send me C. O. D. Kit .....

I will pay the postman the price shown above plus a few cents postage in full payment. (Canadian orders cannot be sent C. O. D.).

Name.....

Address.....

City..... State.....

(Print name very clearly)  
If you prefer to send your remittance with this order, you save the C.O.D. charge. Remit by money order, check, or registered mail. This offer is made only in the United States and Canada. Also see note above.

# Patents

More than 62 years' successful experience securing good Patents for inventors. Write for FREE booklets explaining Patent procedure, selling inventions, etc.

## C.A. SNOW & CO.

Dept. B Snow Building  
WASHINGTON, D. C.

## PATENTS PERSONAL SERVICE

My Personal service assures strictest confidence on all your patent problems. Send me a model or drawing, or sketch and description of your invention, and \$5.00. I will make a search and report promptly as to its patentability and send you a copy of my 72-page booklet. Or, if you prefer to read my booklet first, write today for FREE copy. Registered Patent Attorney.

L. F. Randolph, 340-D Victor Bldg., Washington, D. C.

## Inventions Wanted Patented or Unpatented

We have been successfully selling inventions, patented and unpatented, since 1924. Write for proof, and tell us what you have for sale.  
Chartered Institute of American Inventors  
Dept. 3, Barrister Building Washington, D. C.

## DECORATIVE METAL WORK

A brand new manual for the amateur. Tells in easy to understand language how to make useful metal articles in your home workshop. You'll be surprised how easy and interesting metal work really is. Fully illustrated with diagrams and step-by-step instructions. Sturdy cloth binding, 253 pages. Send only \$2.00 and your copy will be sent postpaid. Popular Science Monthly—Dept. 58, 353-4th Ave., New York, N. Y.

## APC Patenting Plan

★ INVENTORS: Secure immediately effective patent protection through simple, direct filing, but pay single Government fee only. Complete details, free.  
★ AMERICAN PATENTS CORPORATION  
★ Department 3-E, Washington, D. C. ★

## PATENTS—TRADEMARKS

All inventions submitted held confidential and given personal attention by members of the firm. Form, "Evidence of Conception" and instructions, "How to Establish Your Rights"—FREE!

LANCASTER, ALLWINE & ROMMEL  
PATENT LAW OFFICES  
413 Bowen Building Washington, D. C.

## 1,500 NEEDED INVENTIONS

NEW EDITION of this remarkable source book for inventors by R. F. Yates tells what to invent, what inventions manufacturers are looking for, what will pay most money. Also gives new scientific discoveries important to inventors. Enables you to work on inventions that pay. Simple, practical ideas. Large cloth-bound book, 250 pages. Don't waste time. Send \$2.50 today, or send \$4.00 for this great book and INVENTORS' SELLING GUIDE which tells you where and how to sell safely your patented or unpatented inventions to its list of nearly 1000 buyers. Everything you must know about Selling Methods, Law, Royalty Contracts, Financing, Finding Buyers. 224 pages, cloth \$2.00. Send no money if you prefer C. O. D. shipment. Money back if not satisfied.

WRITE FOR FREE CATALOG of valuable books for inventors and sample pages of above books.

DONLEY PUBLISHING CO.  
509 Fifth Ave., Dept. S-5, New York, N. Y.



## New Studies Double Oceans' Estimated Age

DOUBLING their estimates of the age of the oceans, geologists now declare that the vast bodies of salt water that make up a large portion of the surface of the earth have existed for between 500,000,000 and 700,000,000 years. Moreover, they see a possibility that earlier oceans may have existed long before our present ones came into being.

During the last century, geologists first measured the oceans' age by dividing the amount of salt in them by the amount known to be added each year by rivers. This figure was approximately 100,000,000 years. It was based on the assumption that all salt brought to the oceans by rivers remained in them in solution. Later research corrected the figure according to the same reasoning to make the estimated age of the oceans 350,000,000 years. But even this figure was found to be too small. Studying the action of sea-bottom clay on salt water, Dr. A. C. Spencer and Dr. K. J. Murata, of the U. S. Geological Survey, found that some of the salt carried to the oceans is removed by the clay and deposited on the sea floors as a compound that does not easily dissolve. Correcting the old figures for this salt removal gave them the new estimate of 500,000,000 to 700,000,000.

Even this may yet be found too small, according to geologists who are measuring the earth's age by the products of the decay of radioactive elements. They place the earth's age at 2,000,000,000 years or older. While the earth may have been oceanless at one time, there is in the earth's-age estimate plenty of room for earlier oceans than our present ones, it is pointed out.

## Meter Replaces Noses To Test Fresh Fish

AUTOMATICALLY testing the freshness of fish, a new electric meter developed by Dr. J. M. Lemon, of the U. S. Bureau of Fisheries, does away with the less certain methods of judging fish by their odor and "feel." In a recent demonstration before the Fish Advisory Committee of the Department of Commerce, at Washington, D. C., experts explained how the passage of a known electric current through a solution of fish proteins could be measured to show the degree of acidity of the solution. For the first twenty-four hours after a fish is caught, it was pointed out, the lactic acid content of the flesh increases. The higher the acid content, the more current flows through the solution. The novel meter records the current quantity, thus indicating how long the fish has been dead. Although the testing method at present is applicable only to fish that have been dead for periods of less than twenty-four hours, it is believed that the new method of testing will provide a rapid and accurate means by which fresh fish may be selected for commercial shipment into the interior of the nation.

# GET AHEAD FASTER...

## EARN MORE MONEY



"Take advantage of Royal's FREE HOME TRIAL offer. Send in the coupon below right away. I got a big raise—shortly after purchasing a Royal."

**GET A FREE HOME TRIAL!** Without risking a penny—prove that a Royal Portable will help you get that raise. Whatever your job—salesman, executive, inventor, engineer, teacher, student—prove that a Royal will help you think faster, write faster—get your ideas, letters and reports down on paper easily—in modern, readable, saleable form. Prove that it will pay you (your family, too—if you are a family man) to own a Royal Portable!

## Own a ROYAL PORTABLE ON YOUR OWN TERMS!



**READ WHAT ROYAL GIVES YOU:** These great features explain why so many thousands of families are Royal owners. Built by the world's largest company devoted exclusively to typewriters—with standard, full-sized keyboard and easy, effortless action: Touch Control, Finger Comfort Keys, Complete Dust Protection, Genuine Tabulator and numerous other office features. Royal Typewriter Company, Inc., 2 Park Avenue, New York City.

**ACT NOW!** SEE what a latest model, factory-new Royal Portable can do for your family. Then own it on your own terms—cash or only a few cents a day. Mail the coupon today!

**ONLY A FEW CENTS A DAY!**

**FREE!** With every Royal Portable a handsome, all-weather Carrying Case.

**FREE!** Royal's Instant Typing Chart—it shows you how to type right!

**ROYAL TYPEWRITER COMPANY, Inc.** Department B-96, 2 Park Avenue, New York, N. Y. **SEND NO MONEY!**

Please tell me how I can own—for only a few cents a day—a latest model Royal Portable—complete with free Carrying Case and Instant Typing Chart.

I now own a ..... Typewriter, Serial No. .... Tell me how much you will give on it as CASH allowance on a Royal Portable.

Name ..... Street .....  
City ..... State .....

## Prepare At Home For A Better Store Job

40-billion-dollar-a-year retail selling field offers unexcelled opportunities. Prepare at home quickly—in spare time—for a good-pay job, rapid advancement in store selling or management. Fascinating new home-study course points the way to success in this largest of fields. Train under masters of retailing science. Low cost; monthly payments. FREE BOOK gives full details. Send today—no obligation. American School, Dpt. M546, Drexel at 58th, Chicago

## WOOD CARVING and WHITTLING AN ARTISTIC HOBBY FOR ALL

This brand new manual shows you how to do every kind of wood carving. How to carve jewel boxes, picture frames, trays, chests, furniture, etc. How to do chip carving, level surface carving, incising, carving in relief. Carving human and animal figures in the round completely explained and simplified. 256 Pages. Fully illustrated,—full cloth bound. Send only \$2.00 and your copy will be sent postpaid, or order COD plus postage if you wish. Money back if not satisfied.

Popular Science Monthly—Dept. 58  
353-4th Ave. New York, N. Y.

When Writing Advertisers  
Please Mention POPULAR SCIENCE

## KILLS GARDEN INSECTS

Not a Poison to Humans, Birds and Pets

Kill garden insects safely and surely with Red Arrow Garden Spray—the only insecticide most home gardeners need. It kills certain varieties of both sucking and chewing insects with one spraying instead of two. Will not injure plants, not affect fertility of the soil. Protects roses, dahlias, other flowers and shrubs. Also kills ants in lawns. Economical, too; 35¢ bottle makes several gallons of spray. Spray early and often with Red Arrow to kill insects before they multiply. Buy it where you buy your garden supplies.



**Mail Coupon Today For Sample**  
McCormick Sales Co., Dept. 107, Baltimore, Maryland.  
I enclose 10c for sample of Red Arrow sufficient to make 1 gallon of spray.  
Name .....  
Address .....  
City ..... State .....  
My Dealer Is. ....

## WANT A GOVERNMENT JOB?



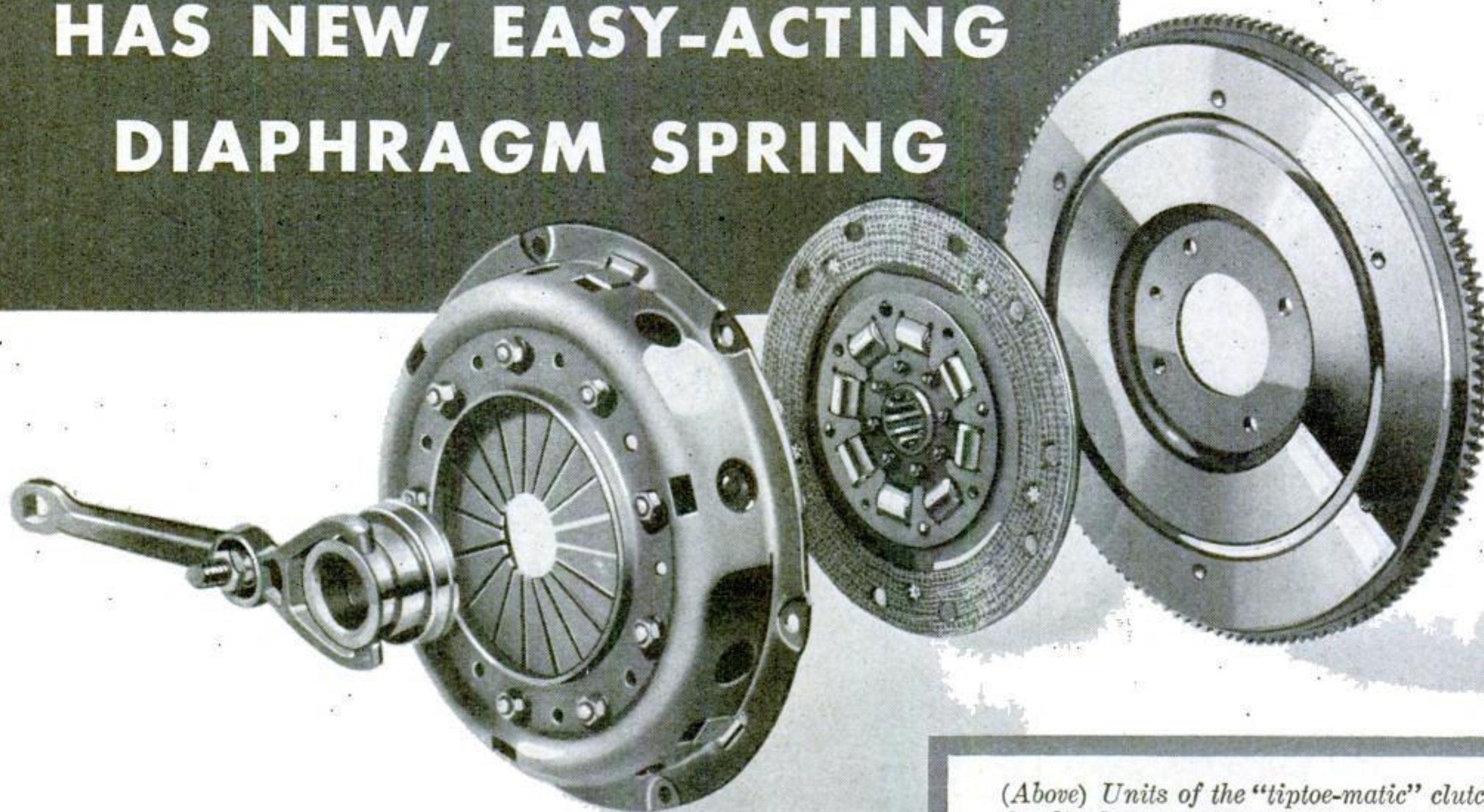
City and Rural Mail—City Post Office Clerks, Clerks at Washington, Customs Inspectors, Stenographers—Typists, etc.

42,766 appointments—1937 Gov't year  
Mail coupon at once.

**FRANKLIN INSTITUTE, Dept. P258**  
Rochester, N. Y.  
Sirs: Rush to me without charge—copy of 32-page book, "How to Get a U. S. Government Job," with list of positions for men-women and full particulars telling how to qualify for them.  
Name .....  
Address .....



# "TIPTOE-MATIC" CLUTCH IN 1938 CHEVROLETS HAS NEW, EASY-ACTING DIAPHRAGM SPRING



(Above) Units of the "tiptoe-matic" clutch; the diaphragm spring is seen within the assembly at the left.

(Below) When a disc goes through the Magnaflux test, even the slightest crack is revealed.

A single disc-like spring, instead of nine separate coil springs formerly required, is the unique feature of a new type of clutch used in all 1938 Chevrolet cars and trucks.

Besides reducing the number of operating parts, the new design effects smoother engagement and requires less pedal pressure. Although the spring exerts a pressure of 1100 pounds, only 25 pounds' pedal pressure is needed to release the clutch. Because of its easy action, the clutch is called "tiptoe-matic."

The spring is a slightly-dished, slotted diaphragm of spring steel. When the pedal is depressed, eighteen radial tongues formed in the disc act as levers to cause the rim of the disc to recede from contact with the pressure plate, thus releasing the clutch.

Clutch engagement is smoother, because the diaphragm spring applies a more uniform pressure around the circumference of the pressure plate; formerly, pressure was applied at nine separate points by the coil springs.



CHEVROLET MOTOR DIVISION, General Motors Sales Corporation, DETROIT, MICHIGAN

General Motors Instalment Plan—Convenient, Economical Monthly Payments. A General Motors Value.

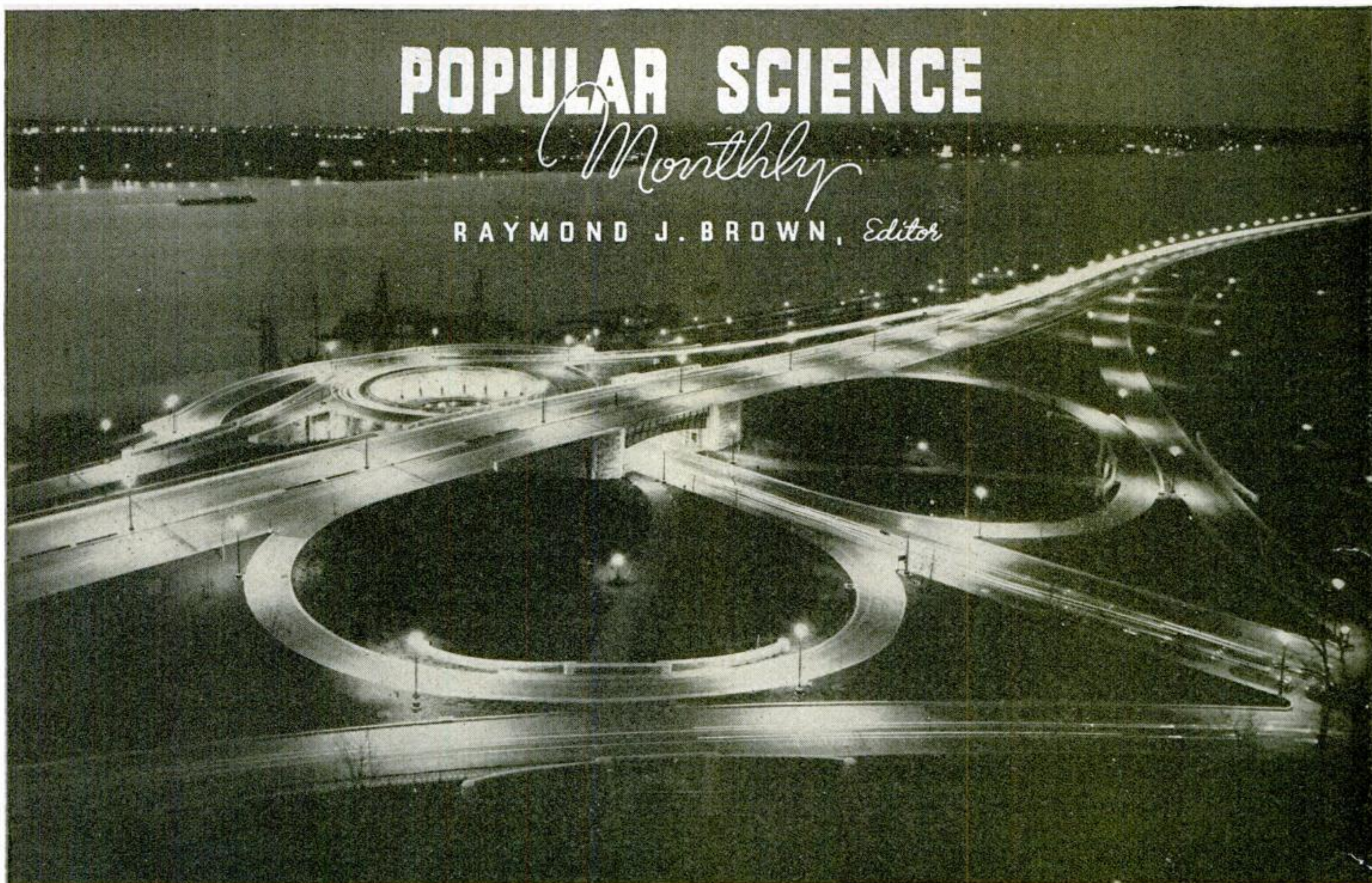
## "You'll be AHEAD with a CHEVROLET!"



# POPULAR SCIENCE

*Monthly*

RAYMOND J. BROWN, *Editor*



Clover-leaf intersections, like this one on the West Side Express Highway in New York City, will be a feature of tomorrow's highways

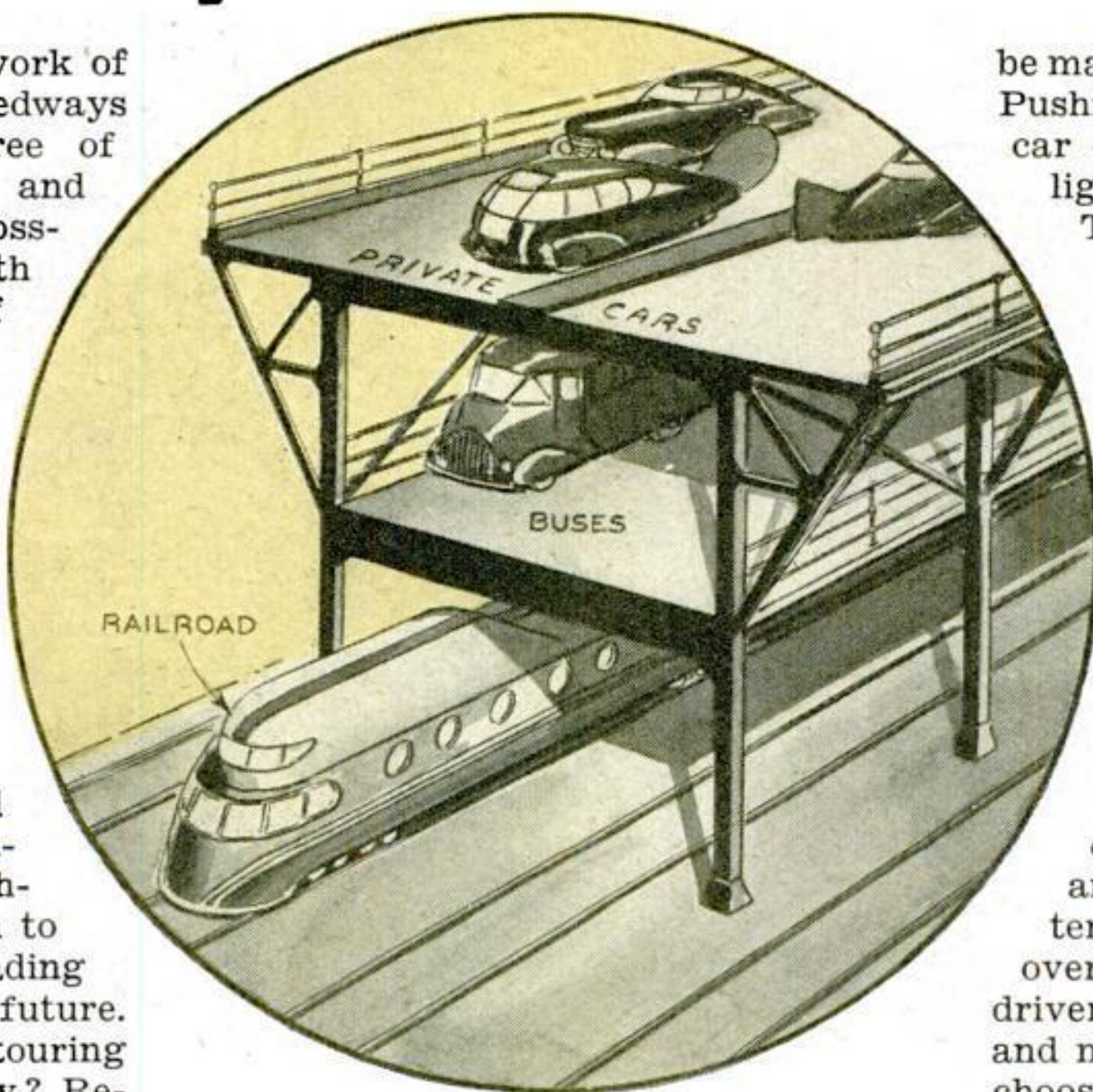
## Highways of the Future

**P**ICTURE a 15,000-mile network of twelve-lane motor speedways spanning the nation—three of them linking the Atlantic and Pacific coasts, six more crisscrossing the country north and south—and you will have an idea of the vastness of a spectacular highway plan proposed by Senator Robert J. Bulkley of Ohio.

Requiring twenty-five years for completion, the mammoth gridiron of superhighways would change long-distance driving from a motorist's nightmare of snarled traffic into a reality of fast, safe transportation. It would represent an impressive start toward an era of scientifically constructed speedways, and crash-proof cars of radical new design to run upon them, foreseen by leading experts for the not-too-distant future.

What will transcontinental touring be like, say, fifty years from now? Recently Dr. Miller McClintock, director of the Harvard University Bureau for Street Traffic Research—the man who is recognized as the nation's foremost authority on traffic problems—gave a startling preview of the momentous changes he sees ahead.

Rear-end collisions, he foresees, will



In congested areas, double-deck roadways with separate levels for commercial and pleasure cars may be built over railroads

be made impossible by a new expedient. Pushing down the brake pedal on a car of the future will operate a stop light that emits infra-red rays. These invisible light rays, picked up and distinguished from ordinary light by a photo-electric cell on the front of a following car, will energize an electric circuit and apply its brakes automatically.

Electric cables, buried beneath the pavements of superhighways, will govern the movement of cars. One set of electromagnetic impulses will control the car's speed. Another set will lock its steering gear against any attempt to make a dangerous turn from one lane to another. Eventually, the cable system may even be adapted to take over steering altogether—allowing the driver to release the wheel, sit back, and make himself comfortable until he chooses to switch back again to manual control.

At night, the superhighways will light up of their own accord, section by section, as a car travels over them. "Electric eyes" spaced along the road will turn on the glareless illumination whenever a car passes, shutting it off at other times to conserve electricity.

By  
**E. W. MURTFELDT**



Imagine a typical section of this superhighway of the future. Straight as a shaft of light, ten or more broad lanes of concrete stretch across the countryside, passing around cities and towns, bridging railroads, canals, and crossroads. Streamline busses roar along a center strip that splits the speedway, separating streams of private cars traveling in both directions. For cars moving at different speeds, each one-way pavement is divided into separate safety, accelerating, cruising, and express lanes.

Hop into a 1988-model car and take an imaginary spin down one of these amazing foolproof roads. Perhaps you arrived at the transcontinental artery by plane, swooping down on one of the concrete flight strips lining the boulevard, or settling to an automatic, radio-controlled landing on a spacious airport built close to a major highway intersection.

Driving up the clover-leaf approach onto the elevated highway, you glide first into the slow-speed safety lane, edge over into the accelerating strip, and turn the steering wheel to swing into the cruising lane. But nothing happens. Your car refuses to respond

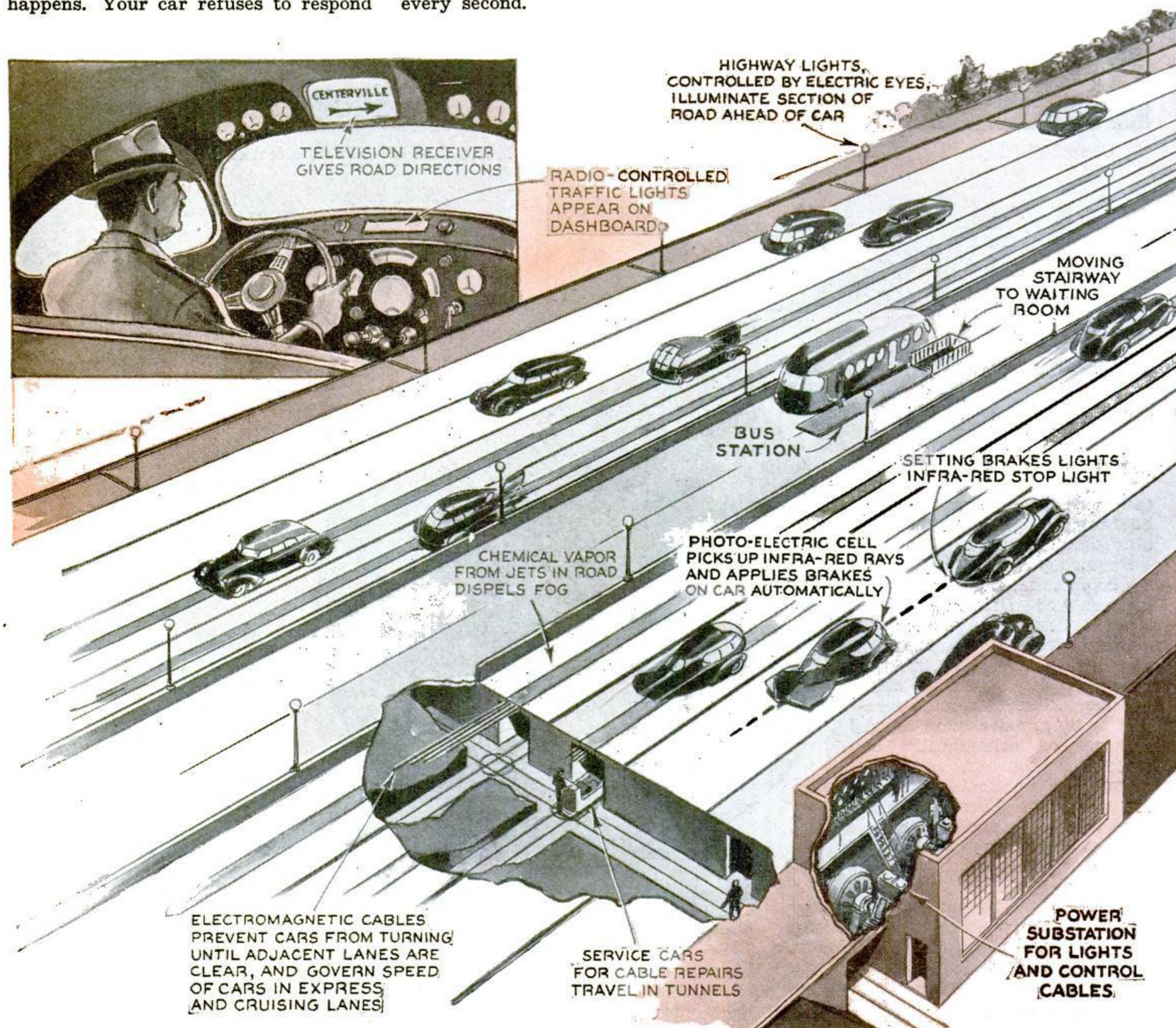
to the wheel, and suddenly you learn why as another automobile whips by on your left at sixty miles an hour. Suspended in service tunnels below the pavement, cables operating on an electromagnetic principle control a mechanism attached to the steering gear to prevent the car from turning left until the adjacent cruising lane is free from traffic for a safe distance.

You try the wheel again. This time the car swings over into the cruising lane and immediately picks up speed. You haven't stepped on the gas, but the speedometer needle creeps steadily upward and freezes on the sixty mark. A second set of buried electromagnetic cables is taking over control of your speed, since cars in the cruising lane must go no more and no less than sixty miles an hour.

But other automobiles are still flying past you on the express lane to your left. Now you swing the wheel over, confident that the car will respond only if turning is safe. In the express lane, your speed automatically steps up to the 100-mile-an-hour limit. Fifty yards of special nonskid pavement flies by underneath your car every second.

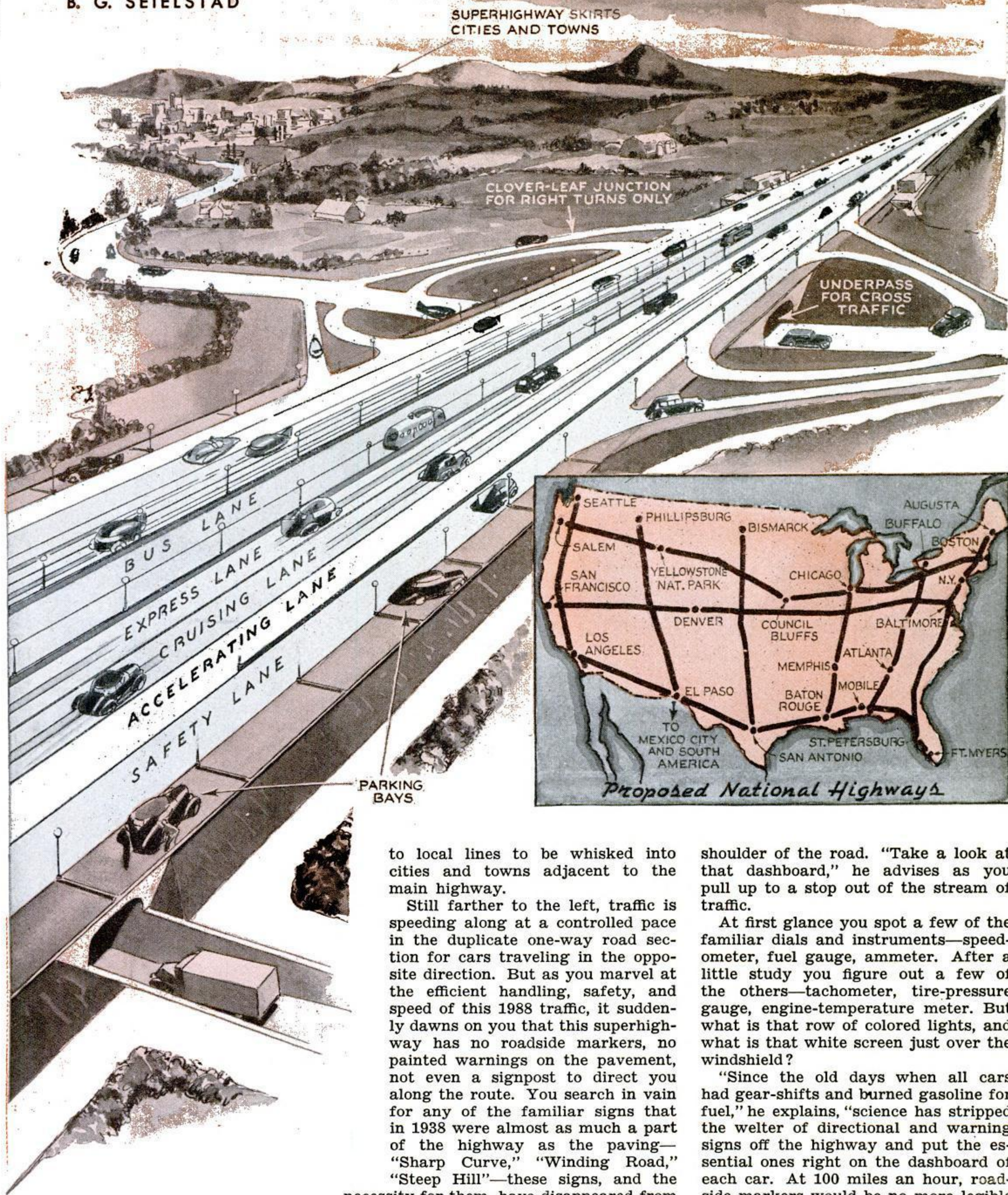
Unless you switch back to a slower lane, you can maintain that pace hour after hour, for you'll never see a traffic light, a railroad crossing, a street intersection, or even a curve sharp enough to slow you down. At twilight, overhead lamps will bathe the road in light. Sleet cannot form on the chemically coated windshield of the car. If you run into fog, chemical vapor escaping from tiny jets in the roadway will clear a lane of visibility. So your top speed of 100 miles an hour is also your average speed—fast enough to let you have breakfast in New York, lunch in Ohio, dinner in Iowa, and a midnight snack not far from the Colorado state line.

As your car eats up the miles in the express lane, you notice on your left a steel barrier that divides you from the broad two-way center lane reserved for express bus traffic. Built into the middle of this bus roadway at the outskirts of cities and towns, and at railroad and route junctions, are station platforms, served by moving stairways from waiting rooms below. Here passengers change from interstate busses





Drawing by  
B. G. SEIELSTAD



This is how traffic experts envisage the superhighway of tomorrow. Careful design, and an elaborate system of electrical safety devices, will enable heavy streams of vehicles to move with a minimum of danger even at high speed

to local lines to be whisked into cities and towns adjacent to the main highway.

Still farther to the left, traffic is speeding along at a controlled pace in the duplicate one-way road section for cars traveling in the opposite direction. But as you marvel at the efficient handling, safety, and speed of this 1988 traffic, it suddenly dawns on you that this superhighway has no roadside markers, no painted warnings on the pavement, not even a signpost to direct you along the route. You search in vain for any of the familiar signs that in 1938 were almost as much a part of the highway as the paving—"Sharp Curve," "Winding Road," "Steep Hill"—these signs, and the necessity for them, have disappeared from main routes years ago.

"But how do I find my way around?" you ask your guide. "How do I know where to turn off for Middletown or Centerville? Is every motorist a mind reader these days?"

Your guide smiles and suggests that you swing off the traveled lanes and nose into one of the parking bays that line the

shoulder of the road. "Take a look at that dashboard," he advises as you pull up to a stop out of the stream of traffic.

At first glance you spot a few of the familiar dials and instruments—speedometer, fuel gauge, ammeter. After a little study you figure out a few of the others—tachometer, tire-pressure gauge, engine-temperature meter. But what is that row of colored lights, and what is that white screen just over the windshield?

"Since the old days when all cars had gear-shifts and burned gasoline for fuel," he explains, "science has stripped the welter of directional and warning signs off the highway and put the essential ones right on the dashboard of each car. At 100 miles an hour, roadside markers would be no more legible than hen tracks, anyway. The law now requires every automobile to be equipped with standard, pretuned, ultrashort-wave radio and television units. On small four-lane side roads, traffic signals are indicated by the colored lights here on the panel.

"Miles before you reach any superhighway (Continued on page 118)





## HOW POLICE CAMERAS REVEAL

# Hidden Crime Clews



Enlarged photographs of fingerprints, like the one seen above, often aid in convicting criminals. Left, motion pictures being projected in a courtroom as evidence in a case under trial



**D**USK was closing down on a midwestern city when a black roadster rolled to a stop on a deserted side street. A man wearing a slouch hat stepped out, looked up and down the street, and then slipped to the rear of a neighboring store. In one hand he carried a small box wrapped in newspapers. A moment later, he returned and drove hurriedly away.

Thirty minutes passed. Then, like a clap of thunder magnified a thousand times, a blast shook the business district. The end of the store was blown to

kindling. Windows for a block around shattered into fragments. The box had held a time bomb filled with high explosives. Fortunately, the intended victim had stepped to the front of his store and escaped without a scratch.

All night long, detectives combed the ruins looking for clews. They photographed the debris. They made casts of footprints found back of the store. They recorded the marks left by tires on the side street. Most important of all, they retrieved fragments of the box which had held the bomb. One piece contained a finger hold characteristic

of chalk boxes used in public schools. This was a valuable clew. But it was another fragment which provided the astonishing piece of evidence that solved the crime.

Under a magnifying glass, one of the detectives noticed what appeared to be faint printing on the piece of wood. He hurried to the photographic laboratory at police headquarters. Here, the expert in charge of the crime-fighting cameras slipped a filter over his lens, adjusted photoflood lamps to throw a strong side lighting on the wood, and snapped the picture.

Detectives crowded around him as he lifted the dripping negative from the developing bath. On it, faint but legible, was printing from a newspaper. The explosion had forced the wood against the paper so violently that an impres-



## By GROVER C. MUELLER

sion of the printing was left on the box fragment. It proved to be part of an item published in a paper in a neighboring city only twelve hours before the blast. This clew led directly to a known enemy of the storekeeper, a school janitor in that city. Confronted by detectives, he confessed his crime.

This amazing instance is but one of many in which photography has played a leading rôle in solving major crimes. The scientific sleuth of today is depending more and more upon the round, gleaming eye of the camera to search out hidden clews. He has gone photographic, and is using everything from huge color-movie outfits to miniature cameras, from highly magnified enlargements to candid snapshots, to trail and convict his man.

Only a few days ago, in New York City, a camera which "saw" something invisible to human eyes led to the conviction of a murderer. A week before, radio cars had raced to an outlying tavern in response to an emergency call. They found a man stabbed to death. The assailant had made his escape. When a suspect was being questioned at police headquarters, a week later, the photographer who had just "mugged" him noticed a peculiar thing about the picture. The faint outlines of a stain ap-

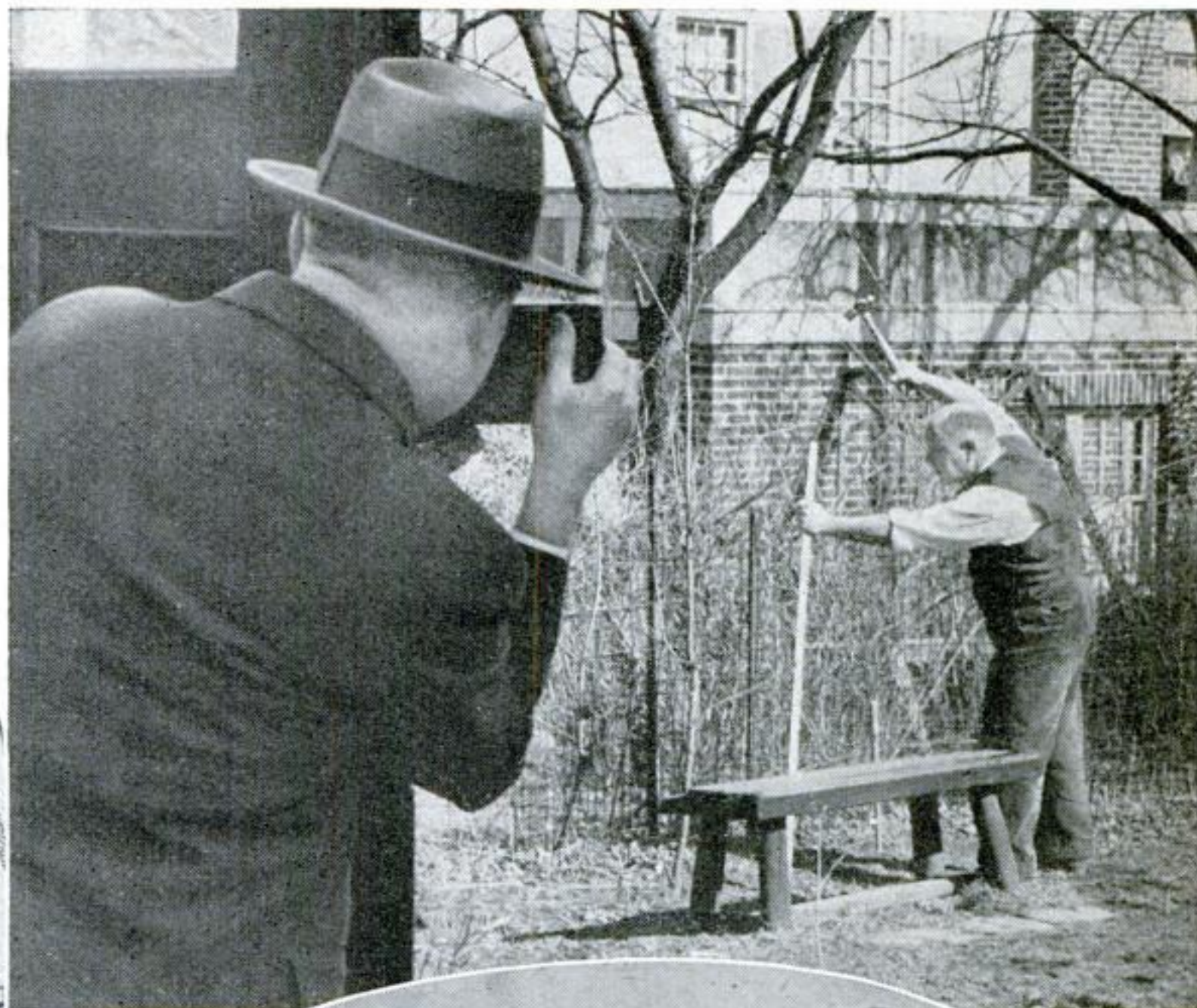
peared on the freshly laundered shirt the man was wearing. Questioned about it, the suspect became confused, gave conflicting statements, and finally broke down. During the struggle with the victim, his shirt had been stained with blood. It had been washed out, but the faint, remaining discoloration, unnoticed by the eye, had been recorded by the supersensitive panchromatic film in the camera.

In another instance, the same type of film revealed an overlooked bloodstain on a carpet. In examining a room where

a murder was thought to have been committed, detectives shot pictures from different angles for later reference. When they studied the developed films, they discovered the outlines of the stain. Although the carpet had been washed carefully, the discoloration was apparent to the camera.

Such films, sensitive to red as well as to other colors, are a boon to the crime fighters. Old types of film were "color-blind" to red. Recently, a new photographic emulsion, said to be four times as fast as that (Continued on page 114)

Cameras "balk" many insurance frauds. In a typical case, a man receiving compensation for an injury claimed that he could not bend his arm. The company had to pay until a camera sleuth snapped the man at work in his garden



Pictures of mobs and riots, made by press photographers or newsreel cameramen, often prove valuable to law-enforcement authorities in identifying ringleaders and participants for arrest

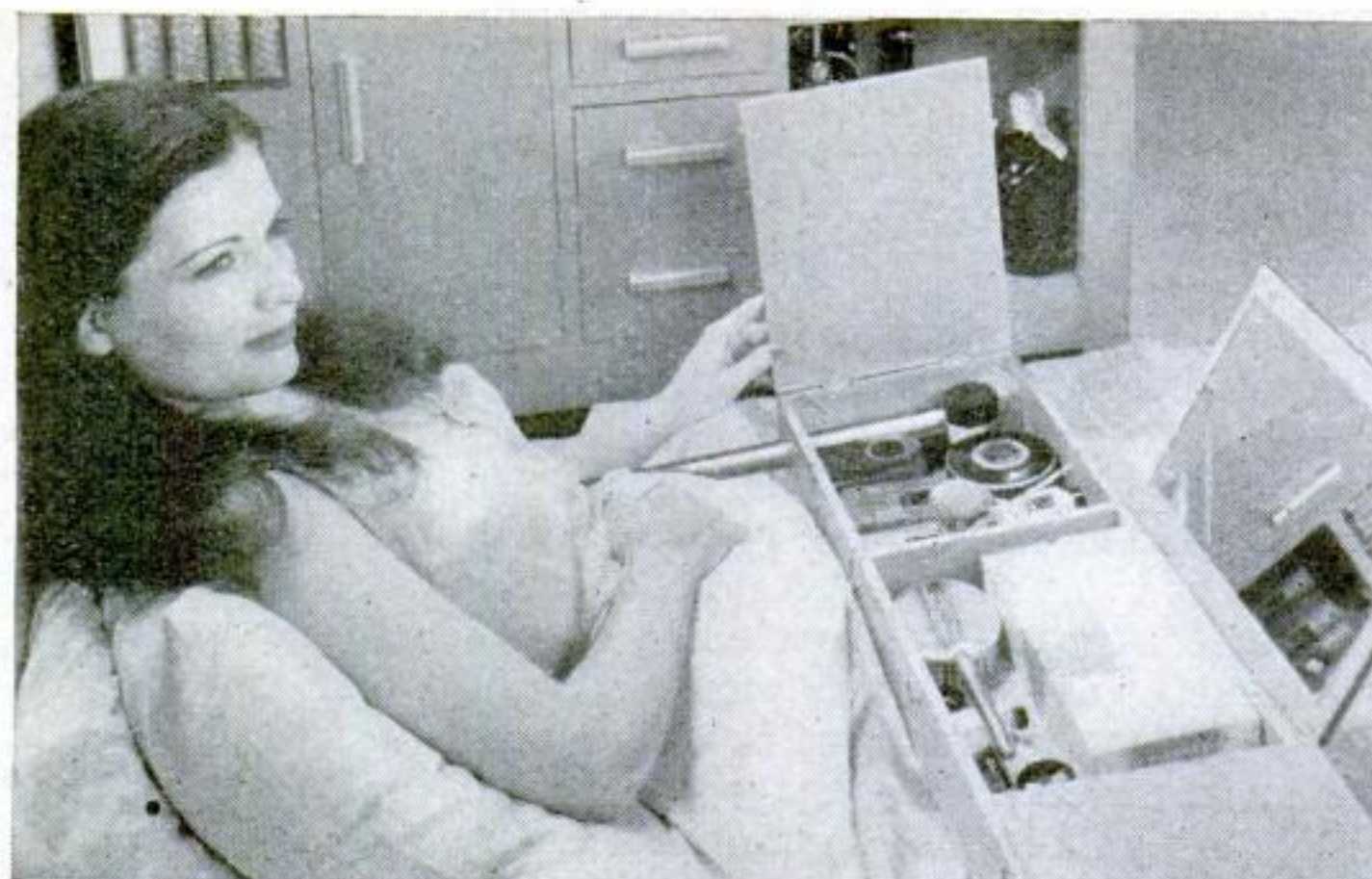


Aerial photographs sometimes reveal objects not visible to observers on the ground. They also are used in hunting bodies under water

From Tiny Candid Snapshots to Colored Movies, Photography Is Helping Modern Scientific Sleuths To "Get Their Men"



## All Comforts of Home Are Built into Bed



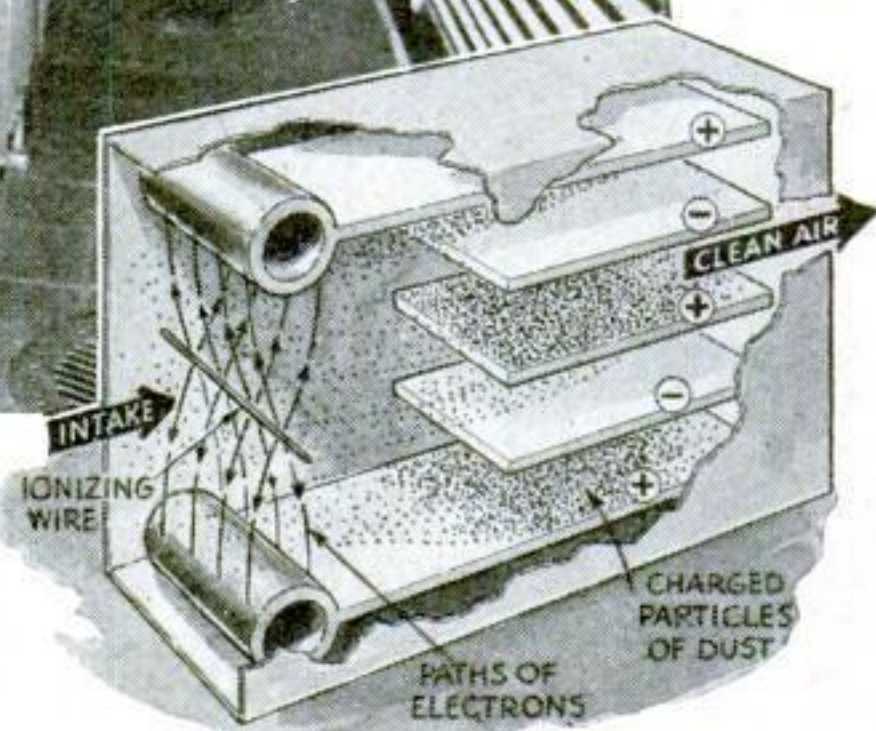
The make-up tray in use. Some of the other conveniences of the handy bedroom unit are seen in the view at left

CLOCK, radio, bookshelves, telephone, storage drawers, outlets for electrical appliances, and other conveniences are provided in the novel bedroom unit shown in the photograph at the left. By raising her arm, the occupant of the bed can swing down a rectangular make-up unit that is supported across her lap by tubular arms hinged to the head of the bed. When opened, this provides a mirror and separate compartments for lotions, manicure tools, and other toilet accessories.

## Air Cleaner Removes Dust By Electricity



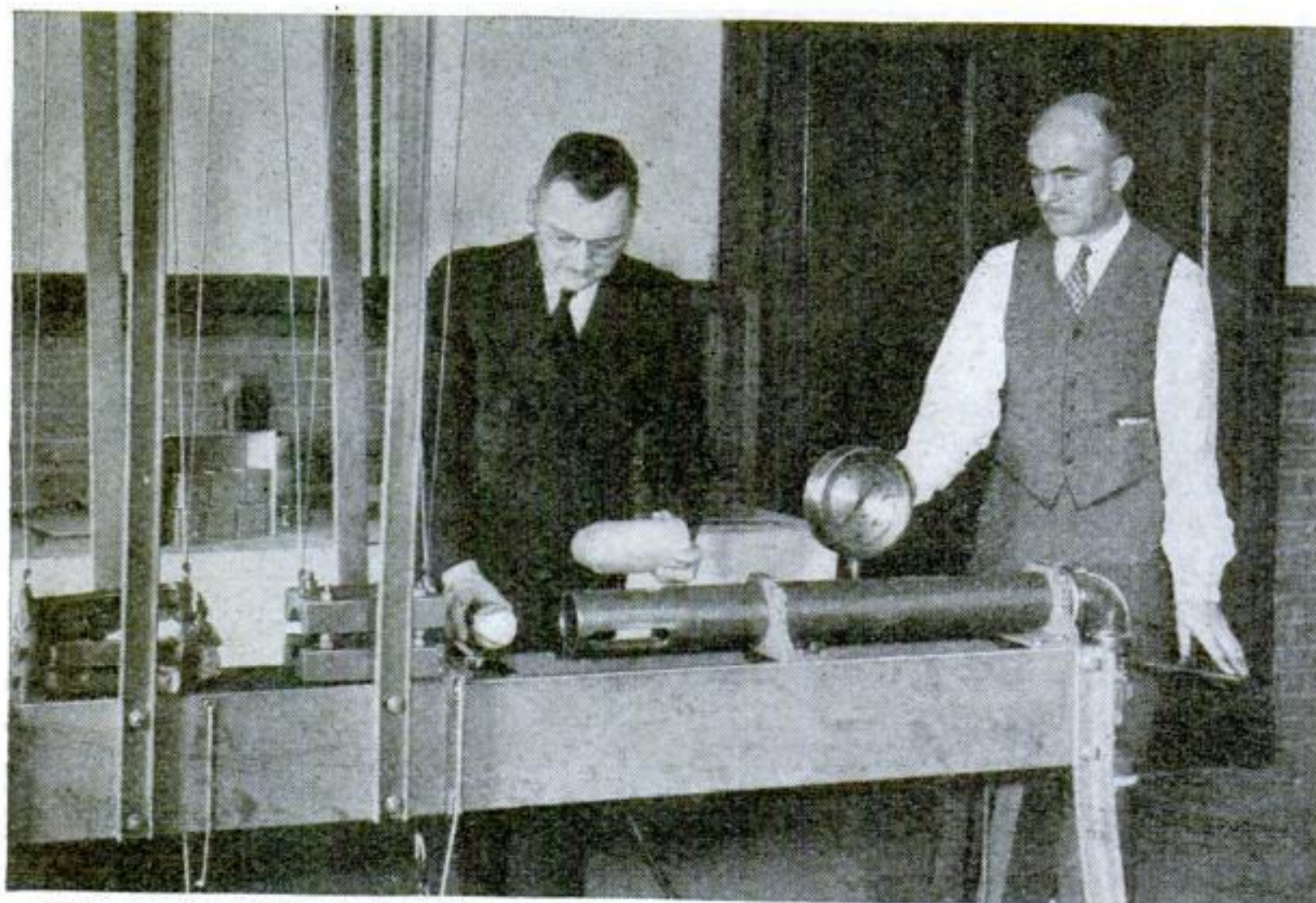
NINETY-NINE percent of all dust particles, even those as minute as four millionths of an inch in diameter, are said to be removed from the air by a new electrical cleaning apparatus developed by Westinghouse research engineers and installed in a New York City store. Replacing the conventional mesh filter, a series of hair-thin, electrically charged wires in the intake system bombard dust particles in the incoming air to give them an electrical charge. When this treated air is drawn through a system of metal plates that form an electrical field, the electrified dust particles are attracted to charged plates while the cleansed air passes on through ducts into the building, as illustrated in the typical unit shown in the drawing at the left.



These charged plates attract dust particles. The drawing shows how the new system works

## Mechanical Batter Slugs Balls To Test Their Liveliness

TO SETTLE the question of whether the type of baseball used in one major league is more lively than that used in the other, the National Bureau of Standards devised the batting machine shown at the right. A compressed-air gun shoots a hardwood projectile, representing a bat, against the ball at speeds up to 200 feet a second. The ball is caught in a special speed-measuring device and its liveliness determined by the ratio between its measured speed and the speed of the projectile bat. In an outdoor test, the device "batted" balls many feet beyond the record of baseball sluggers.



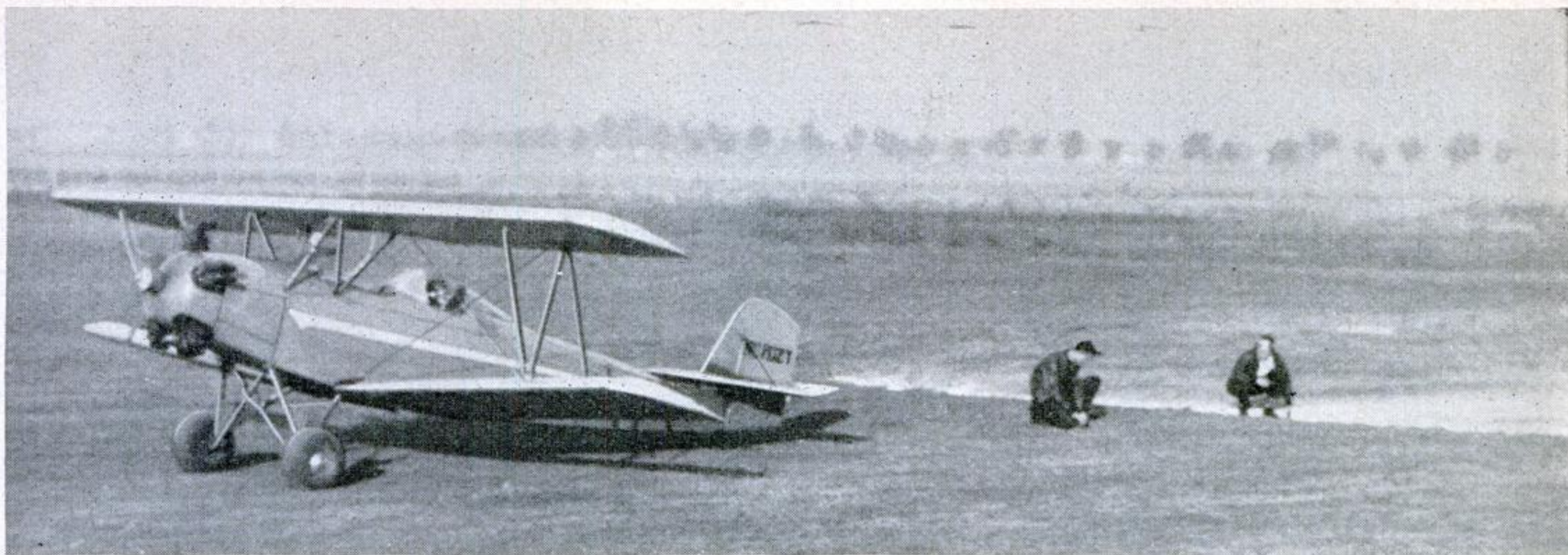
This machine "bats" baseballs to determine scientifically how lively they are

## Device Labels Sausages

INDELIBLE labels are printed on sausages and other meats packed in natural casings by an automatic machine operating on the decalcomania principle. The device is designed to protect housewives from the substitution of inferior products for well-known brands.







# College Flyers

## COMPETE IN THRILLING AÉRIAL TRACK MEETS

**H**UNDRED-MILE-AN-HOUR athletes, representing the University of Southern California and Stanford University, recently met in a spectacular track meet of the air staged at Mines Field, Los Angeles, Calif. Riding in light planes, they competed in landing skill, bombing accuracy, cross-country navigation, and balloon-bursting. Each plane was allowed three minutes to accomplish the latter feat. At 2,500 feet, the pilots wheeled and zoomed in an effort to strike and explode the small gas-filled rubber balloons. Next, the ships slid down, one after the other, from an altitude of 1,000 feet while the pilots tried to land as nearly as possible on a chalk line drawn across the field. With engines roaring again, they climbed to 500 feet and hurled bombs of sand and lime at

a thirty-foot bullseye. Points were scored much as in a regular track meet. Last year, the University of Southern California won the West Coast Championship and later captured the national title in competition with thirty-four other universities.

Officials checking a pilot's showing in a spot-landing event. The object is to place the tail skid as near as possible to a line



A campus ace dropping a "bomb"—a paper bag of sand and lime—on a ground target

Left, a timekeeper waves a flyer in with his checkered flag at the finish of one of the events

Scores in the bomb-dropping contest are determined by measuring hits, as shown below

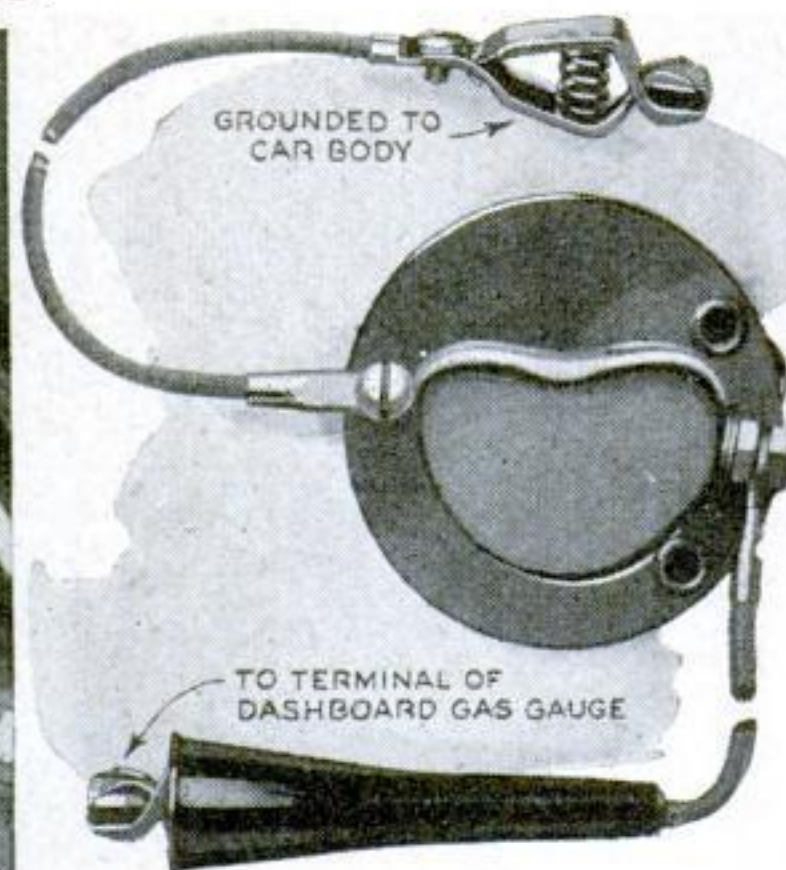
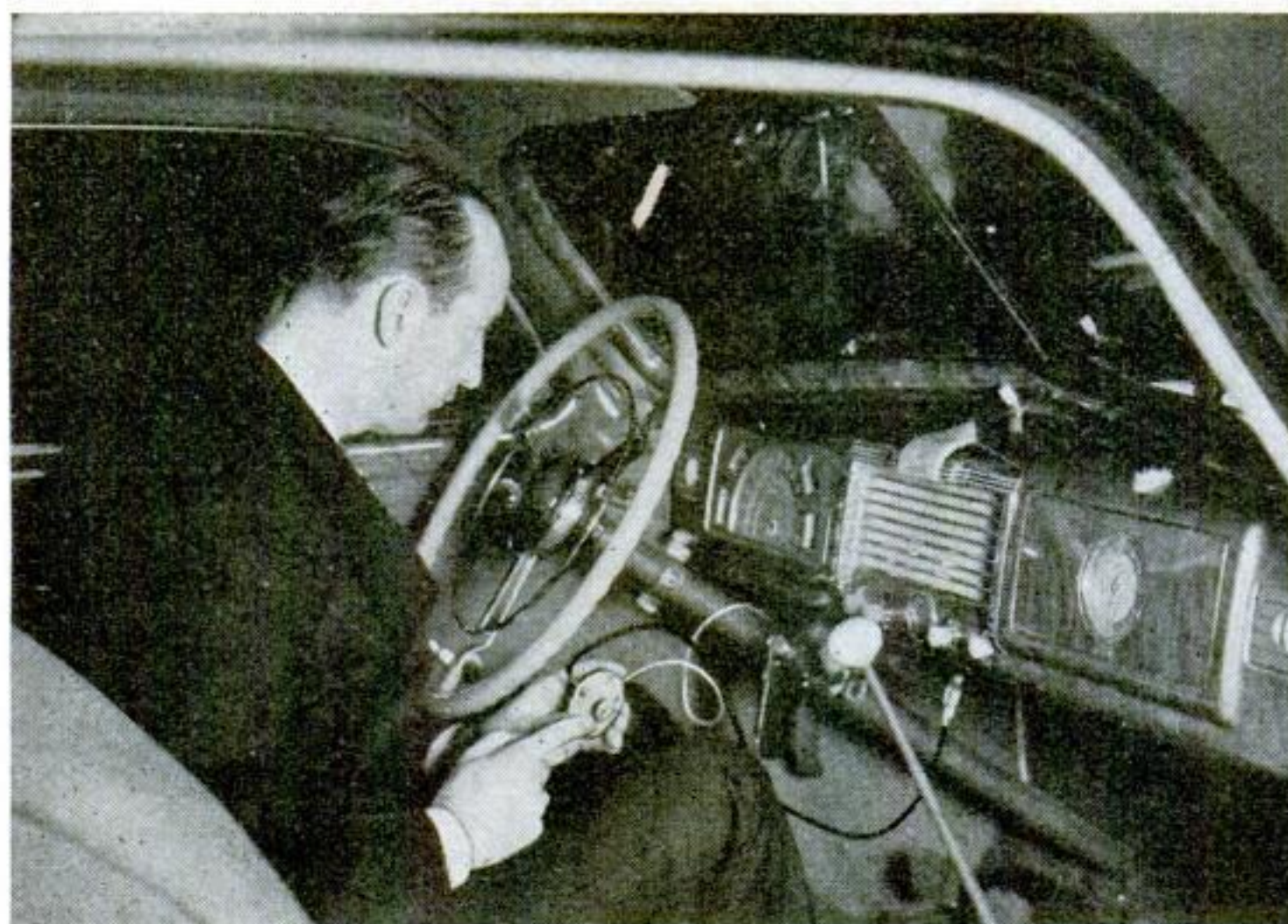
Here pilots are getting instructions for a cross-country navigation test. Each must plot his own course to an objective and return to the field



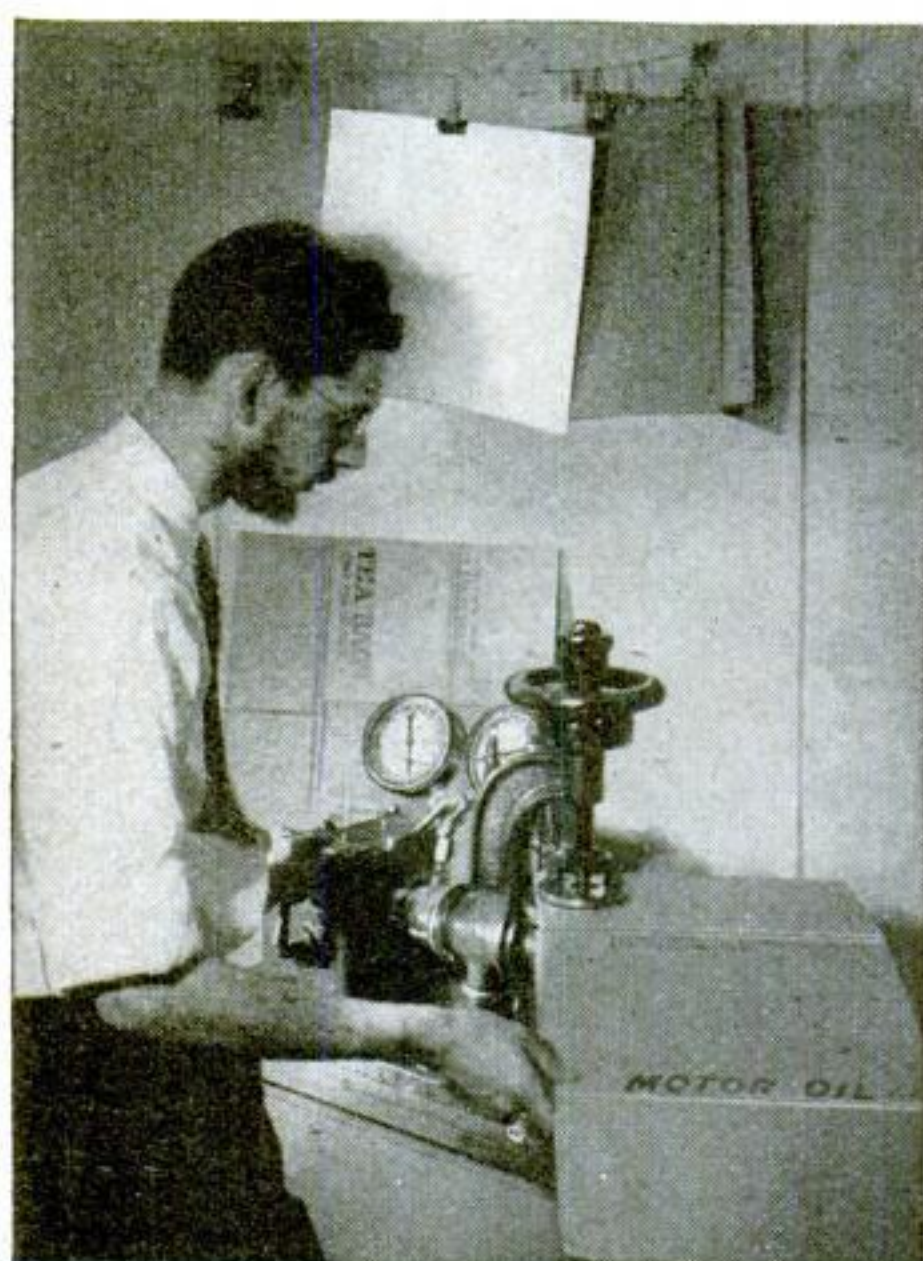


# Compact Unit Tests Electrical Fuel Gauges on Cars

ELECTRICALLY operated gasoline gauges on automobile dashboards can now be checked for accuracy by means of a compact testing device recently placed on the market. About the size of a watchcase, the unit is connected to a terminal of the dashboard gauge by one wire, and grounded to the car body with another. Moving a lever on the back of the test unit after the car ignition switch has been turned on, the operator is able to check the adjustment of the electrical gauge system by noting whether the needle pointer centers on the "full" and "empty" marks.



Handy fuel-gauge tester and, at left, the unit attached to a car's dashboard to check the electric gas-measuring system



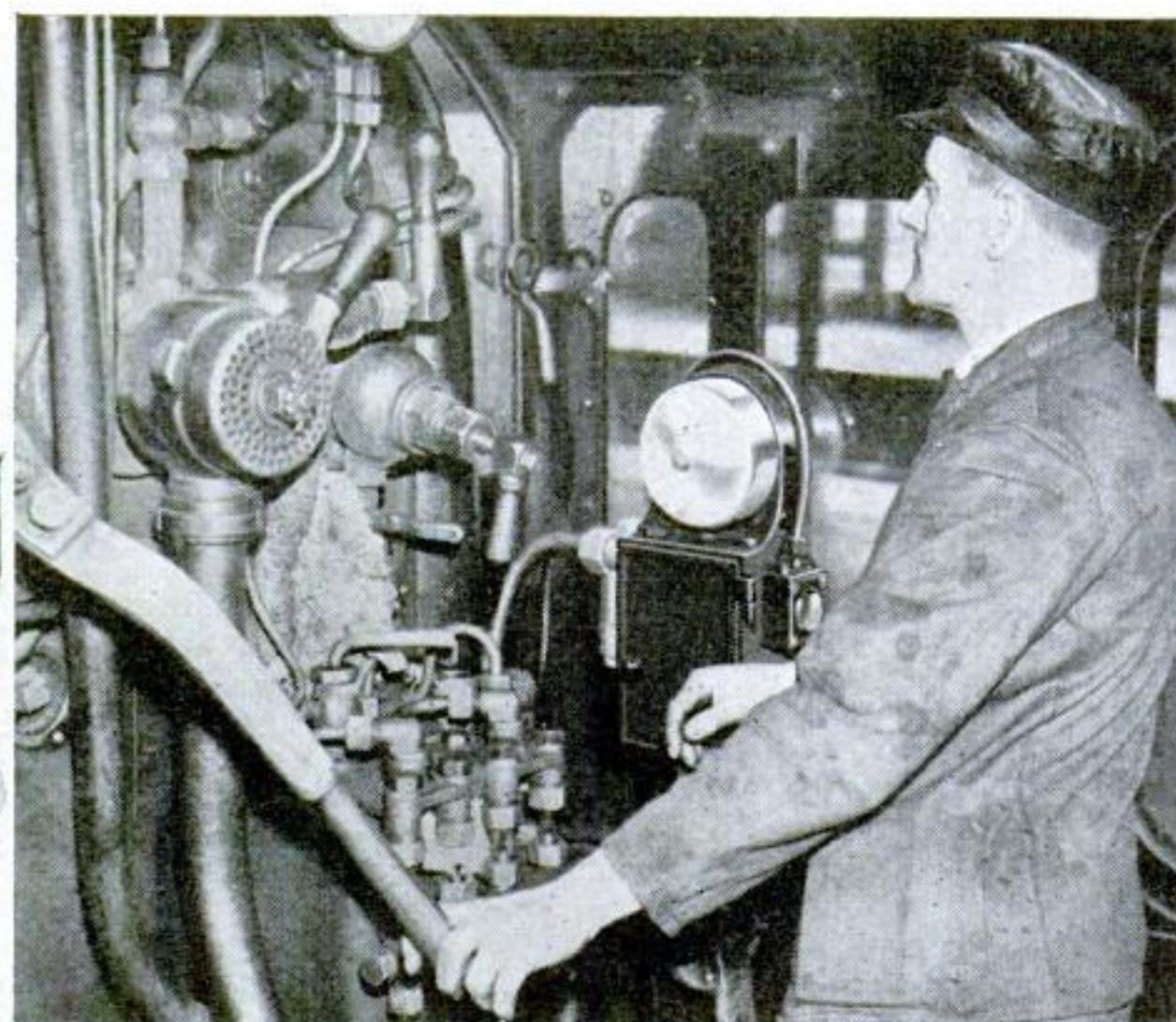
## Laboratory Checks Up on Shipping Cartons

BELIEVED to be the only one of its kind in the world, a laboratory recently set up in New York City tests the strength and durability of cartons and other cardboard containers used by manufacturers in shipping merchandise. In the photograph above, a laboratory technician is checking the "puncturability" of a cardboard carton used for shipping cans of automobile motor oil.

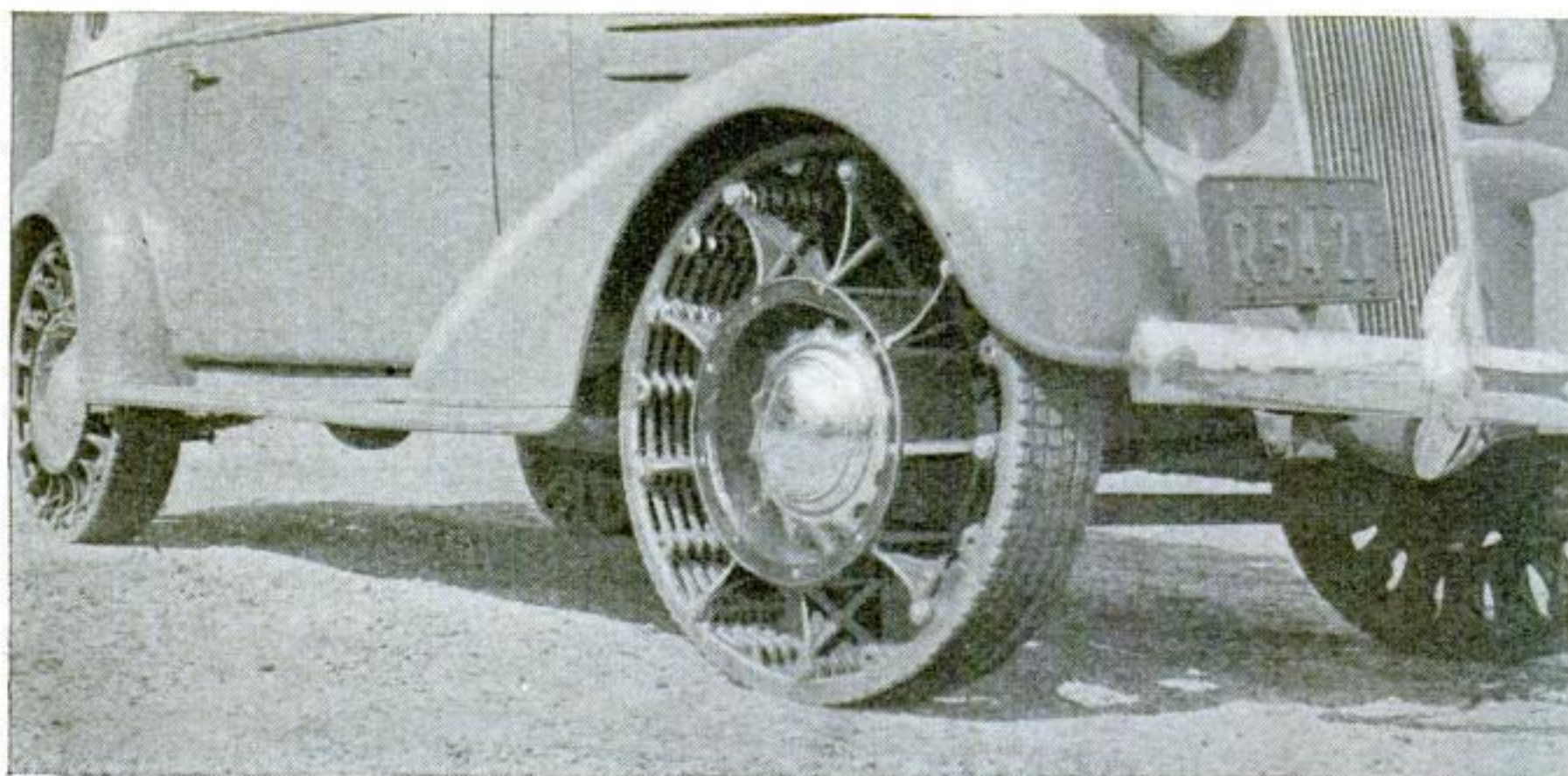
## New Signal System Controls Trains in Fog

WHEN dense fog prevents engineers from seeing trackside signals, a new device introduced on an English railway allows trains to maintain scheduled speeds despite adverse weather conditions. As the train approaches a fog-shrouded semaphore, a metal shoe under the locomotive contacts an electrified third rail set between the two running rails. This is connected to the signal sys-

tem so that if the track ahead is clear, a bell rings in the cab, informing the engineer that it is safe to proceed at his present speed. If the signal arm is set at the "caution" or "stop" position, however, a siren blares and brakes are automatically set throughout the train to bring it safely to a stop. On account of the frequent occurrence of fog in England, visual signals are often obscured.



Just in front of the engineer is the signal device that tells him whether or not the track is clear as the engine passes the contact rail seen at the left

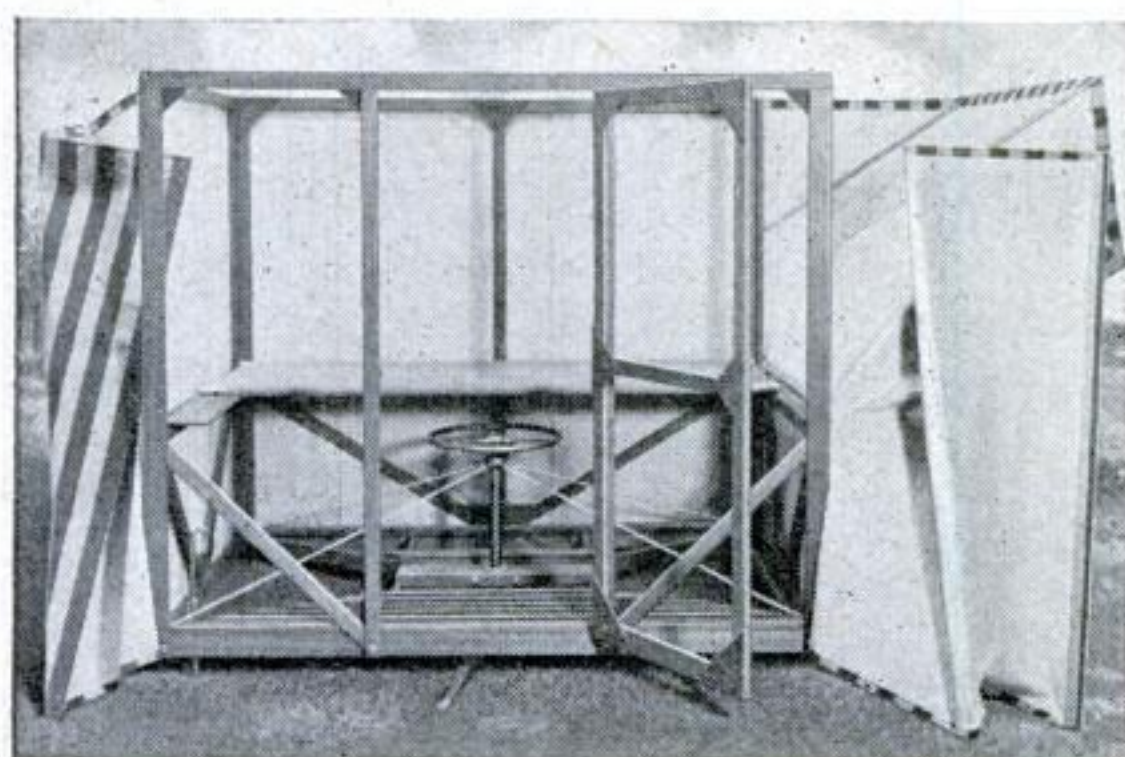


## Rubber Spokes Give Bounce to Airless Safety Tires

HARD WOOD, embedded in rubber, forms the rim of a new safety tire invented by J. V. Martin of Garden City, N. Y. Said to be more resilient and lighter than pneumatic types, the safety tire has hoops of hickory incased in rubber and fitted with criss-cross spokes of ribbed rubber. Punctureproof and blowout-proof, the airless tires absorbed practically all vertical movement when a springless test car drove over four-inch blocks strung along a concrete road in a recent trial, it is claimed.







Portable sun-bathing tent with front walls removed, showing rotating mechanism. Top view, shelter in use

## Rotating Shelter Aids Sun-Bathers

BY TURNING a "steering" wheel while lying on a cot within the canvas side walls of a new tent, a sun-bather can rotate the "sun tub" to follow the movement of the sun and thus insure maximum exposure to its rays. The 150-pound sun-bathing tent can be folded compactly for easy transportation.

## Dental Patients Can Give Themselves Gas

DENTAL patients administer pain-killing gas to themselves with an improved type of inhalator recently demonstrated at a display of dentists' equipment. Connected to a cylinder of nitrous oxide, the apparatus is strapped to the head and adjusted so that inhaling tubes extend into the nostrils, as shown below. By pressing a hand bulb, the patient can take just enough gas to deaden pain as the dentist works on the teeth.



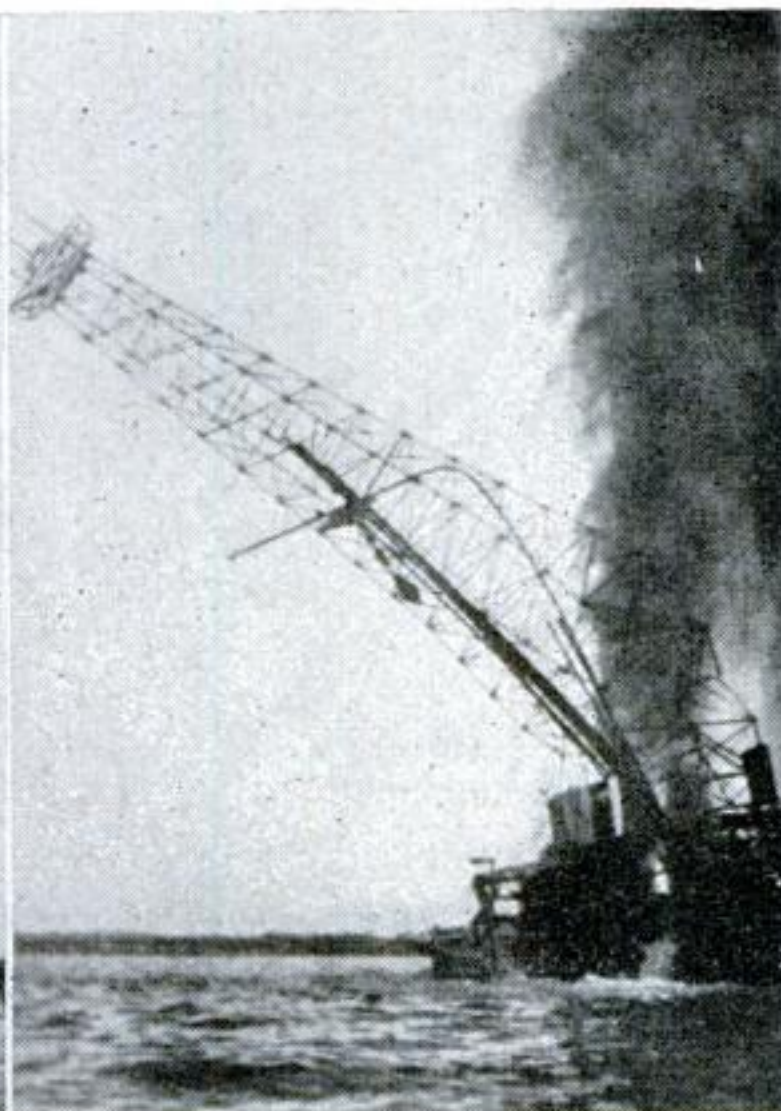
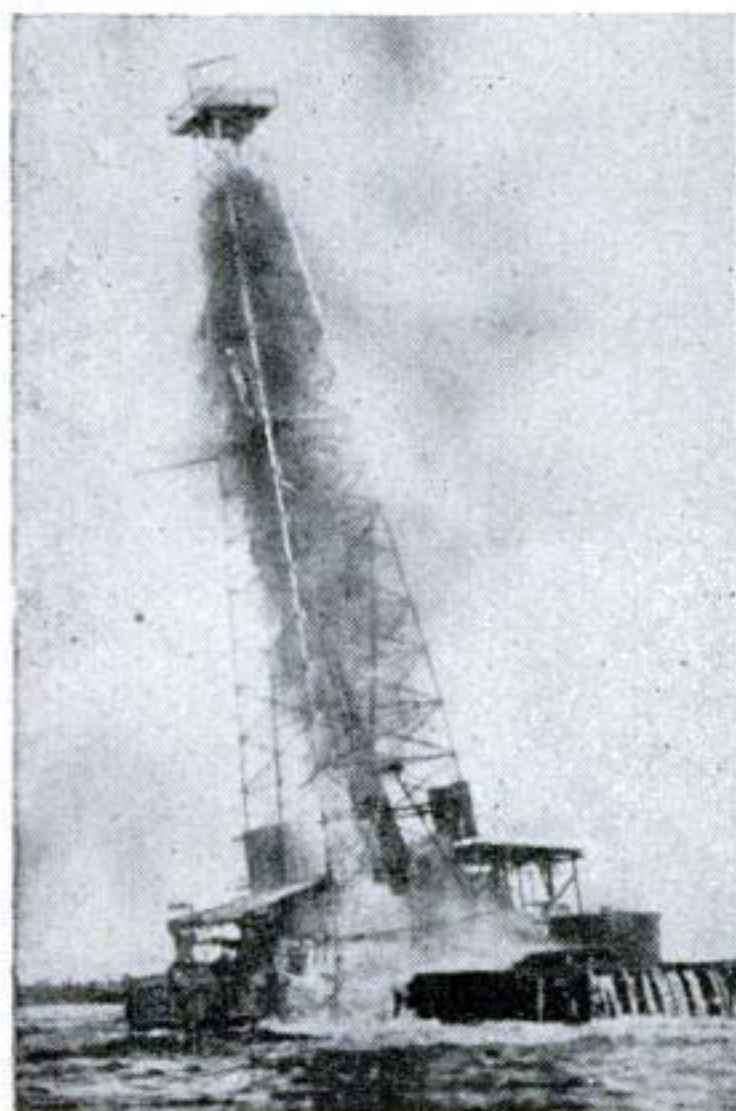
With this inhalator strapped to the face, a patient can take gas by pressing a hand bulb

## Photographs Tell Story of Odd Oil-Well Explosion

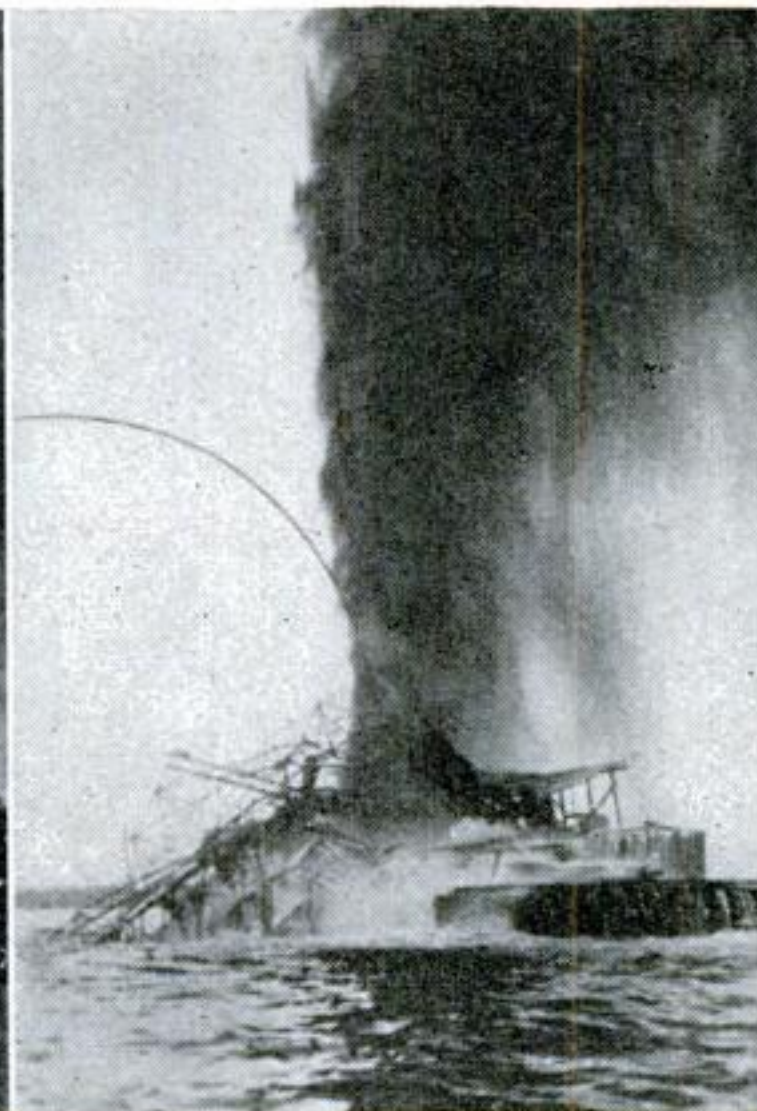
WHEN an oil well being drilled in the bed of Lake Maracaibo, Venezuela, blew out and the derrick collapsed into the water, a photographer snapped the remarkable set of pictures reproduced below by courtesy of the National Tube Company. The derrick and drilling machinery were mounted on a platform supported by piles driven into the lake

bed. When gas and oil pressure undermined the piling, the surface structure began to topple, as shown in the first photograph below. As the derrick collapsed, the 1,100-foot drill pipe was blown from the hole, became snarled temporarily in the derrick girders, and then whipped itself free and was shot out to a height of almost 800 feet in the air.

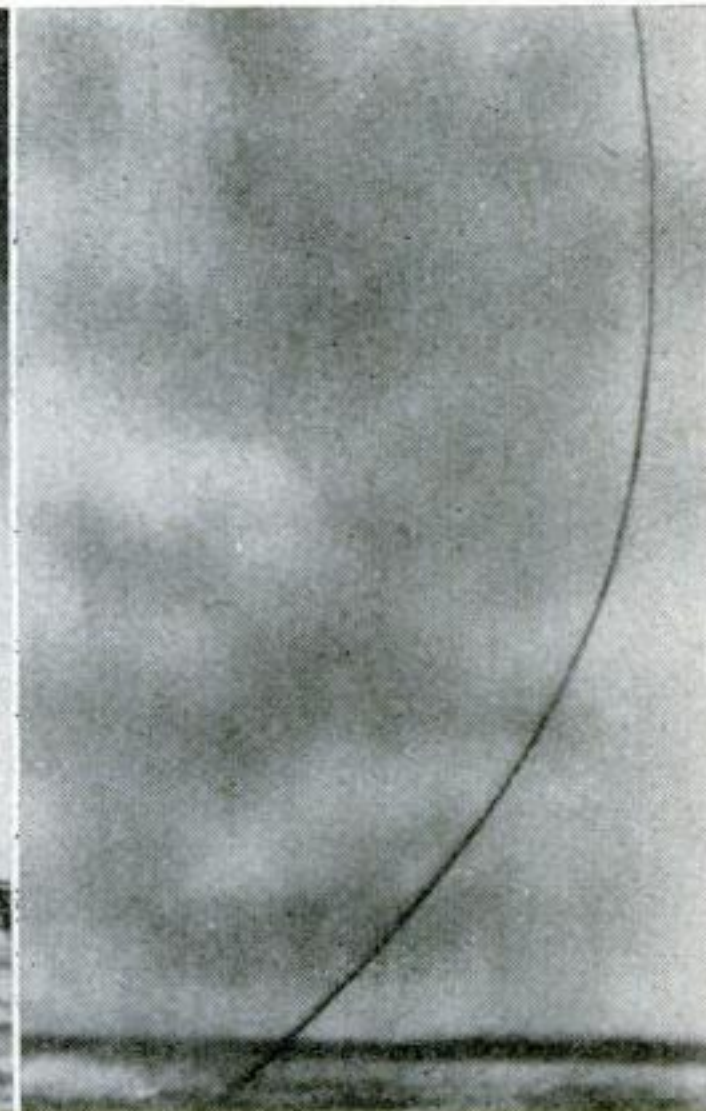
The photograph on the extreme right shows the drill pipe falling back into the water less than thirty feet from the launch which was carrying the drilling crew to safety and from which this set of pictures was being taken. Later examination of the six-inch pipe revealed not a single fault or fracture throughout its entire length.



Oil derrick in Lake Maracaibo, Venezuela, toppling as gas pressure undermines its supports. Note the drill pipe forced up into the tower



As the derrick collapses, the six-inch steel drill pipe frees itself and whips upward, shooting into the air to a height of almost 800 feet





LATEST  
BOATING  
SPORT...

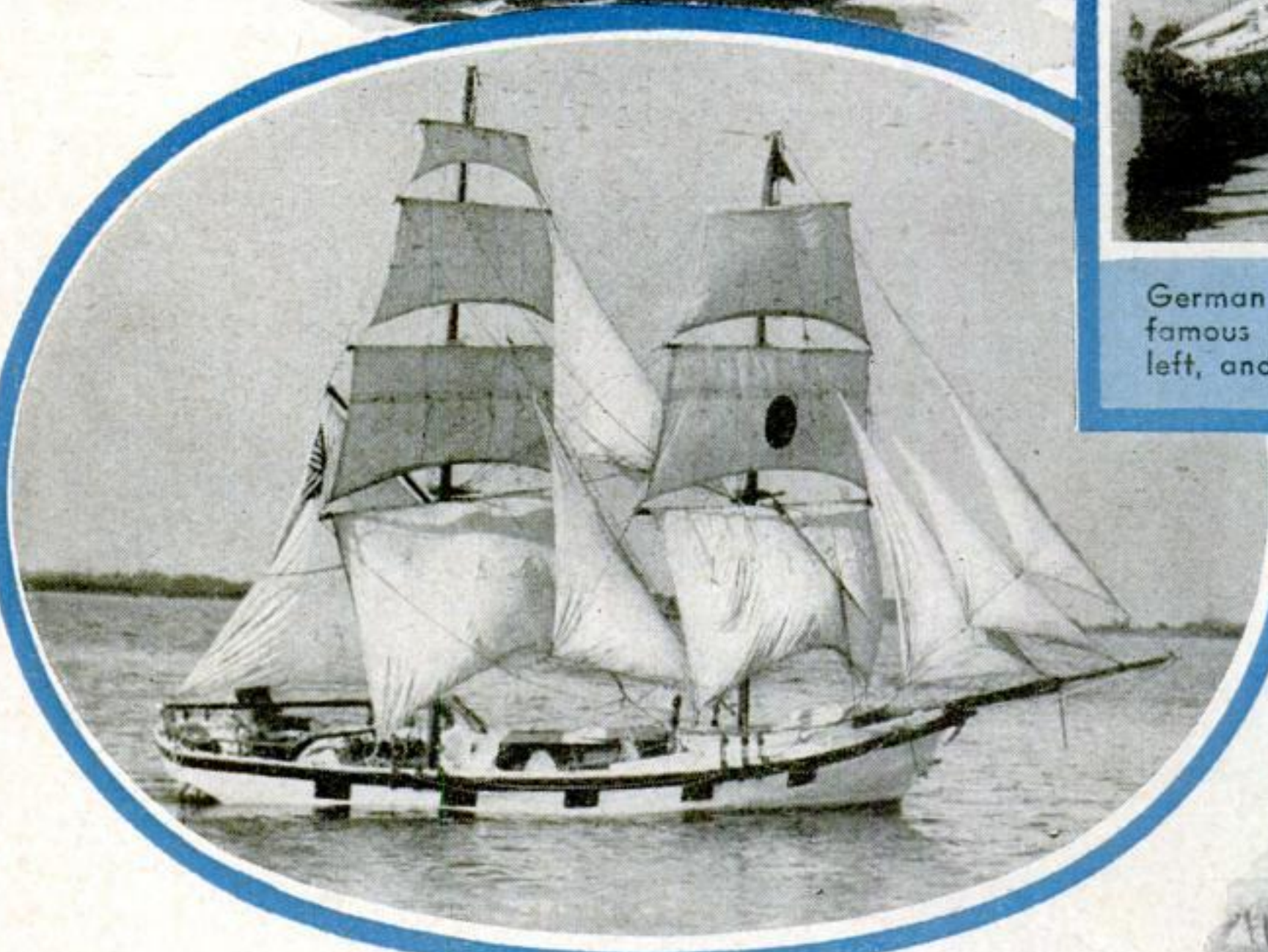
# Sailing

**A**MATEUR boat builders in many parts of the world are going down to the sea in midget ships. They are putting off in men-of-war, square-rigged traders, ocean liners, and superdreadnoughts barely larger than rowboats, yet reproducing in every detail ships that are famous in nautical history.

Off the Eastern Shore of Maryland, in the summer, Capt. Carl von Zielinski, of Staten Island, N. Y., maneuvers his *Isobel III*, an eighteen-foot reproduction of an early American trading brig. It is complete even to the black disk painted on the fore-topsail, the insignia of the famous Black Ball Line of clippers and packets.

Another sailing vessel which has been reproduced in miniature is the *Constitution*, the celebrated "Old Ironsides" of the War of 1812. Capt. James A. Callan, a veteran of the U. S. Navy, constructed the pygmy fighting ship. Recently, he presented it to the U. S. Naval Academy, at Annapolis, Md., to be used as a training vessel. Midshipmen actually sail the little frigate, climbing to the yards, furling and unfurling the sails, getting a taste of navy life as it was a century and more ago. Gun ports open to reveal sixteen miniature cannons.

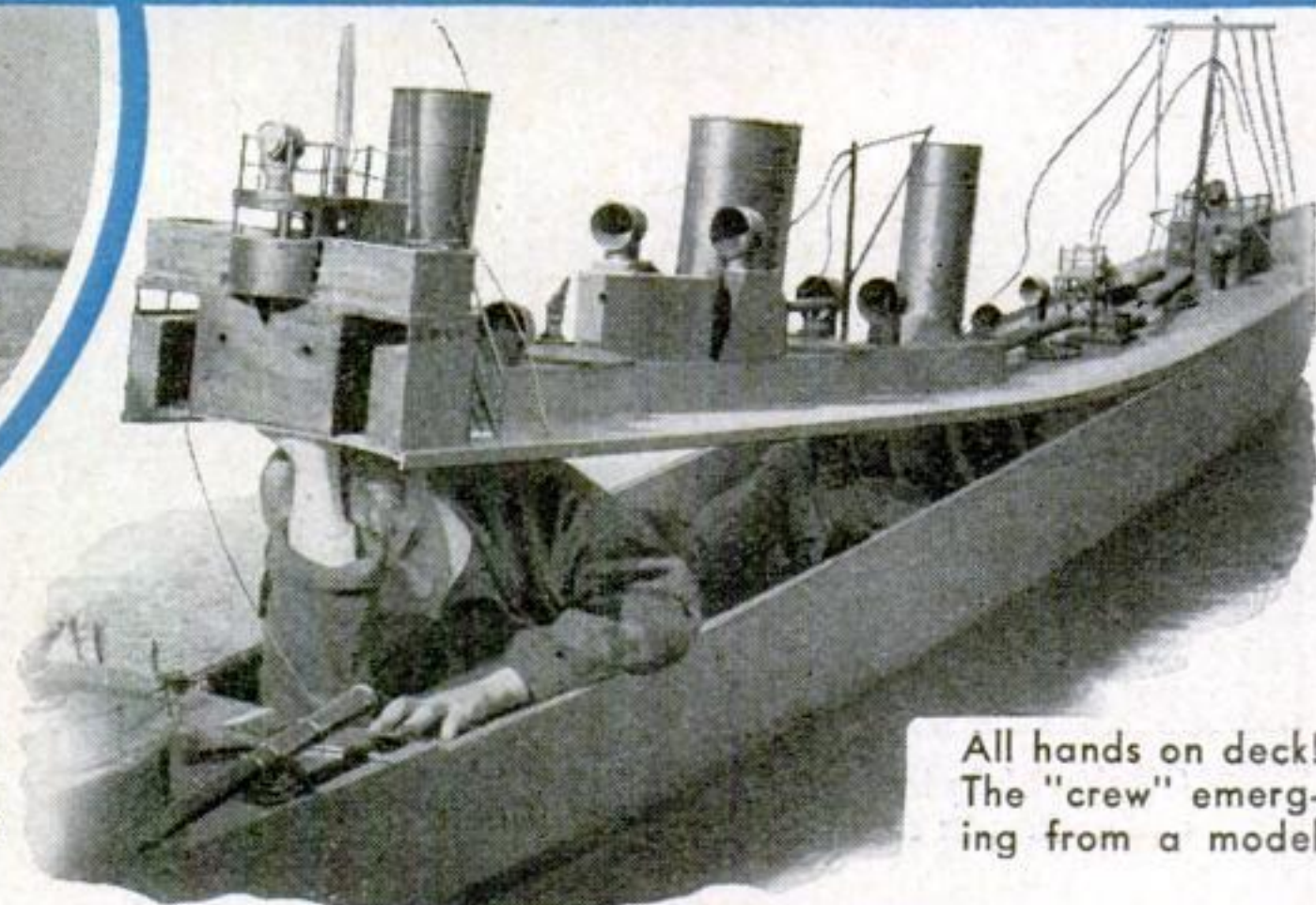
British tars, recently, sailed two other midget men-of-war along the English coast during naval maneuvers. One was a reproduction of Sir Francis Drake's flagship,



Two views of the "Isobel III," an eighteen-foot scale reproduction of a square-rigged ship, owned and sailed by Capt. Carl M. J. von Zielinski. One man can handle the tiny craft, seen head-on in the upper picture



German schoolboys operating large models of two of their country's famous vessels—the modern cruiser "Hindenburg," seen at the left, and the five-masted training ship "Preussen"—near Potsdam



All hands on deck! The "crew" emerging from a model



# Midget Ships

the *Golden Hind*. The other was Lord Nelson's famous fighting ship, the *Victory*. Both vessels were equipped with heavy keels and could fire broadsides from the half-size guns they carried.

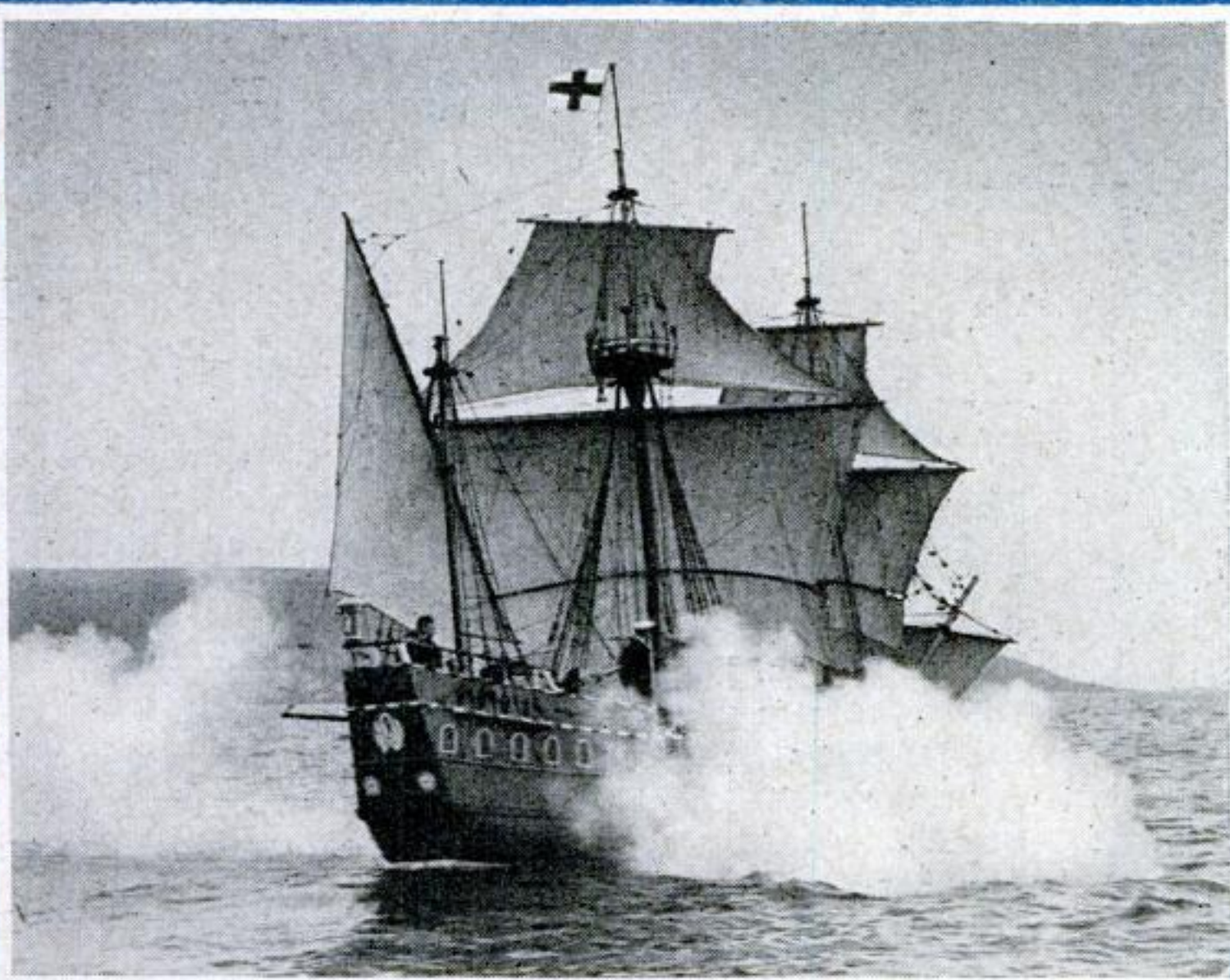
In Germany, a group of sea-minded boys, at the Potsdam Boat Construction School, have reproduced in miniature two modern battle cruisers, the *Hindenburg* and the *Konigsberg*. On the decks of the former are nearly two dozen guns mounted in revolving turrets. Real searchlights flash signals from the all-steel superstructure. Both of these seaworthy models carry several sailors and make good time under their own power.

Of all the members of the fast-growing midget fleet, the most elaborate is a scale reproduction of the North German Lloyd transatlantic liner *Columbus*. This model, complete to the last porthole, attracted wide attention not long ago when it was brought to this country on the S. S. *Bremen* and given a trial run in New York Harbor. During the tests, it attained a speed of ten miles an hour.

By ARTHUR A. STUART



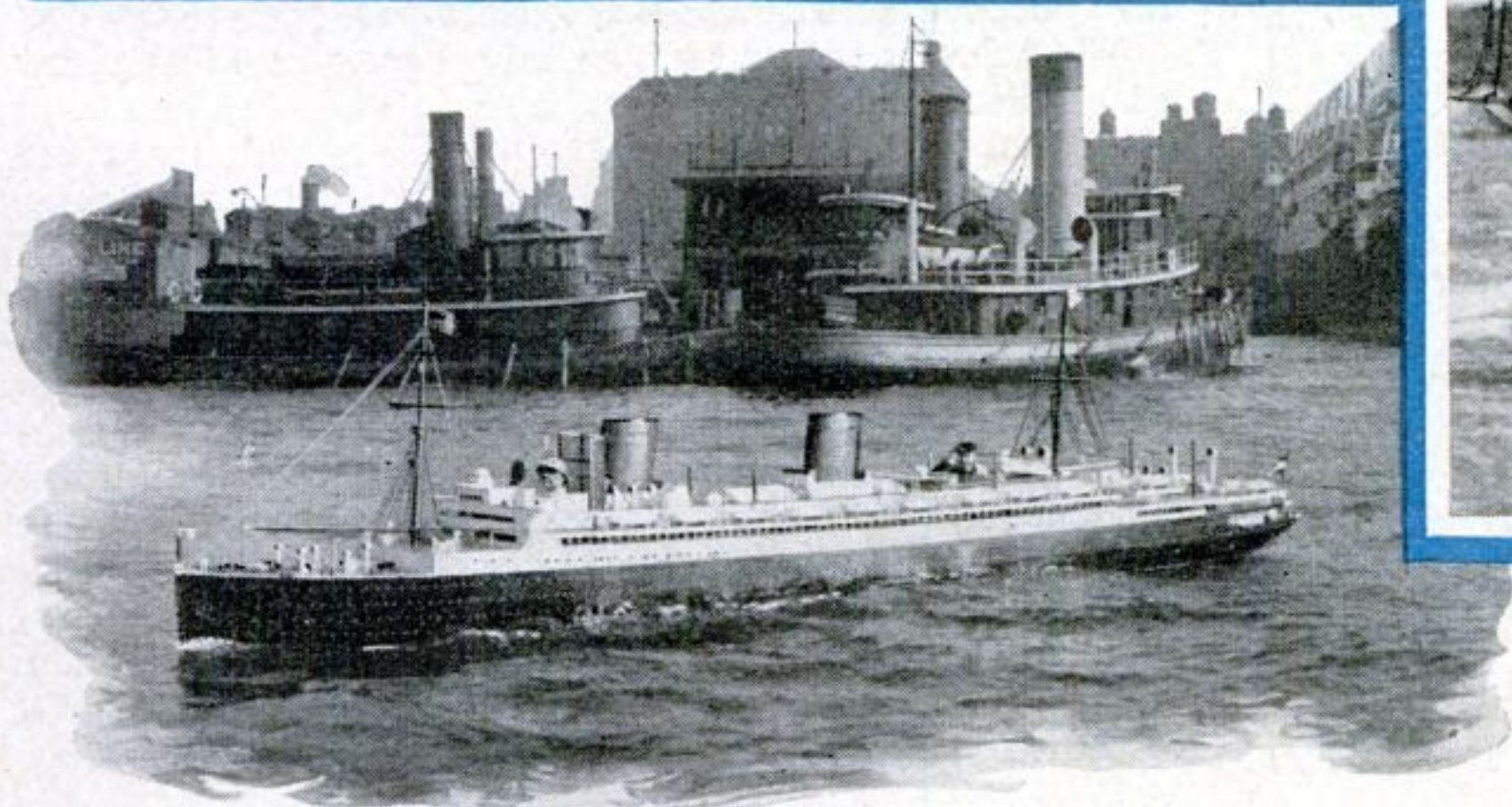
This young admiral is learning how a modern warship's superstructure is made



A historic vessel sails again—a half-size reproduction of Sir Francis Drake's "Golden Hind," first English ship to sail around the world. Here the model is firing a broadside from her guns



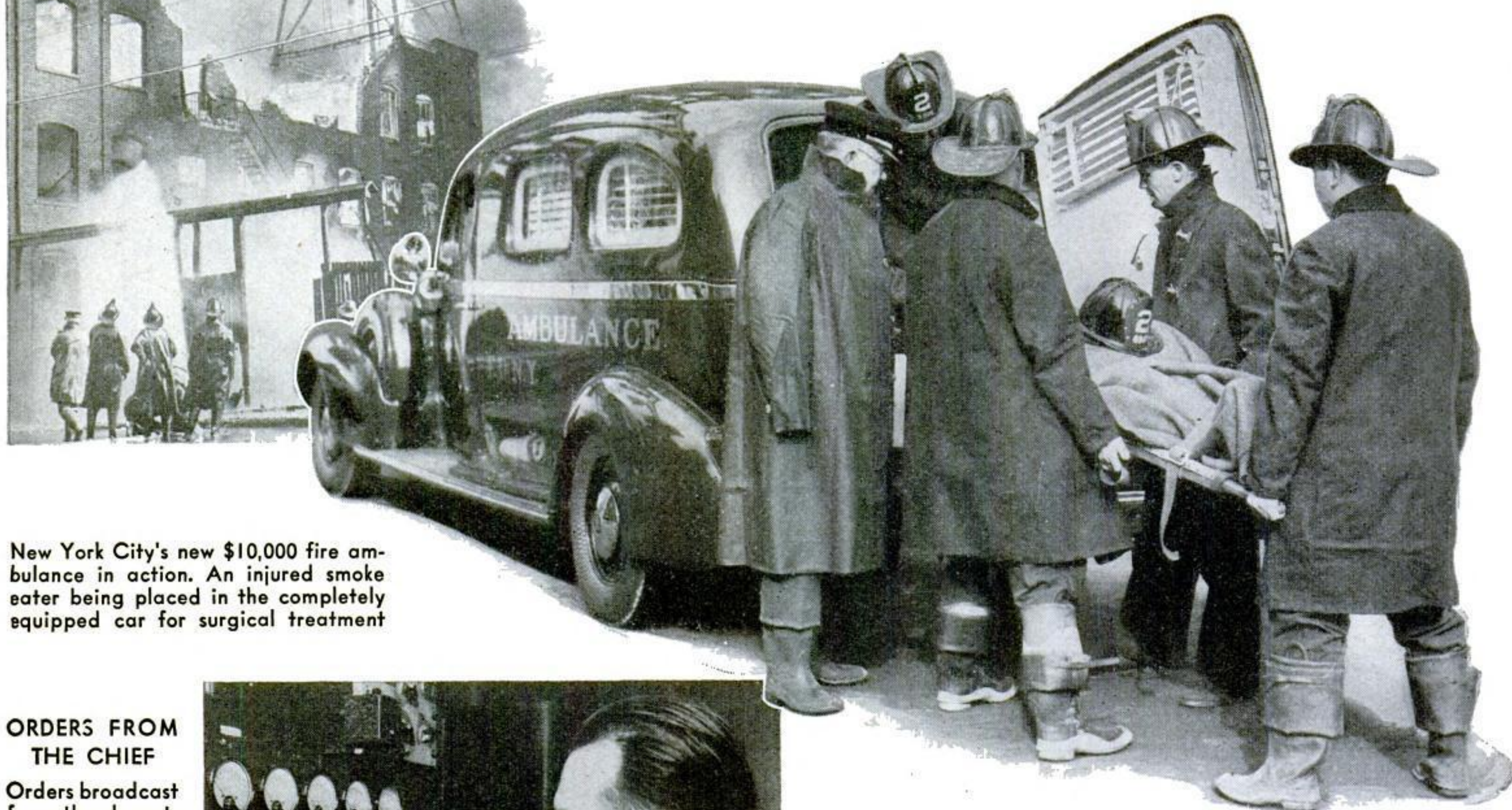
Sea scouts manning "Constitution Junior," a forty-seven-foot sailing model of "Old Ironsides." Left, a scale reproduction of the S.S. "Columbus" in the Hudson River at New York. Note the two men's heads





# New Hospital on Wheels

**BRINGS FIRST AID TO MEN WHO  
FIGHT NEW YORK'S FIRES**



New York City's new \$10,000 fire ambulance in action. An injured smoke eater being placed in the completely equipped car for surgical treatment

## ORDERS FROM THE CHIEF

Orders broadcast from the department's short-wave radio station, as at right, are received by the ambulance driver through earphones. A two-way system permits a running exchange of reports and instructions to be maintained



**F**IVE-ALARM FIRE! Thirty-five engines and trucks racing through the streets before dawn. Three hundred crack smoke eaters battling a block-square conflagration. That was the scene, a few weeks ago, when 3,000,000 feet of lumber in a big Brooklyn, N.Y., yard turned into billowing clouds of smoke and darting streamers of flame.

For hours, the firemen fought to keep the blaze from spreading. One man was carried out with a broken leg. Another was hurried from the scene with blood streaming from a gashed hand. Still others staggered about with eyes so inflamed they could hardly see. By the time the blaze was under control, twenty-one firemen were on the injured list. In aiding them, New York City's new \$10,000 fire ambulance—an amazingly complete, ninety-mile-an-hour hospital on wheels—played an important part. The big fire was its spectacular initiation into service.

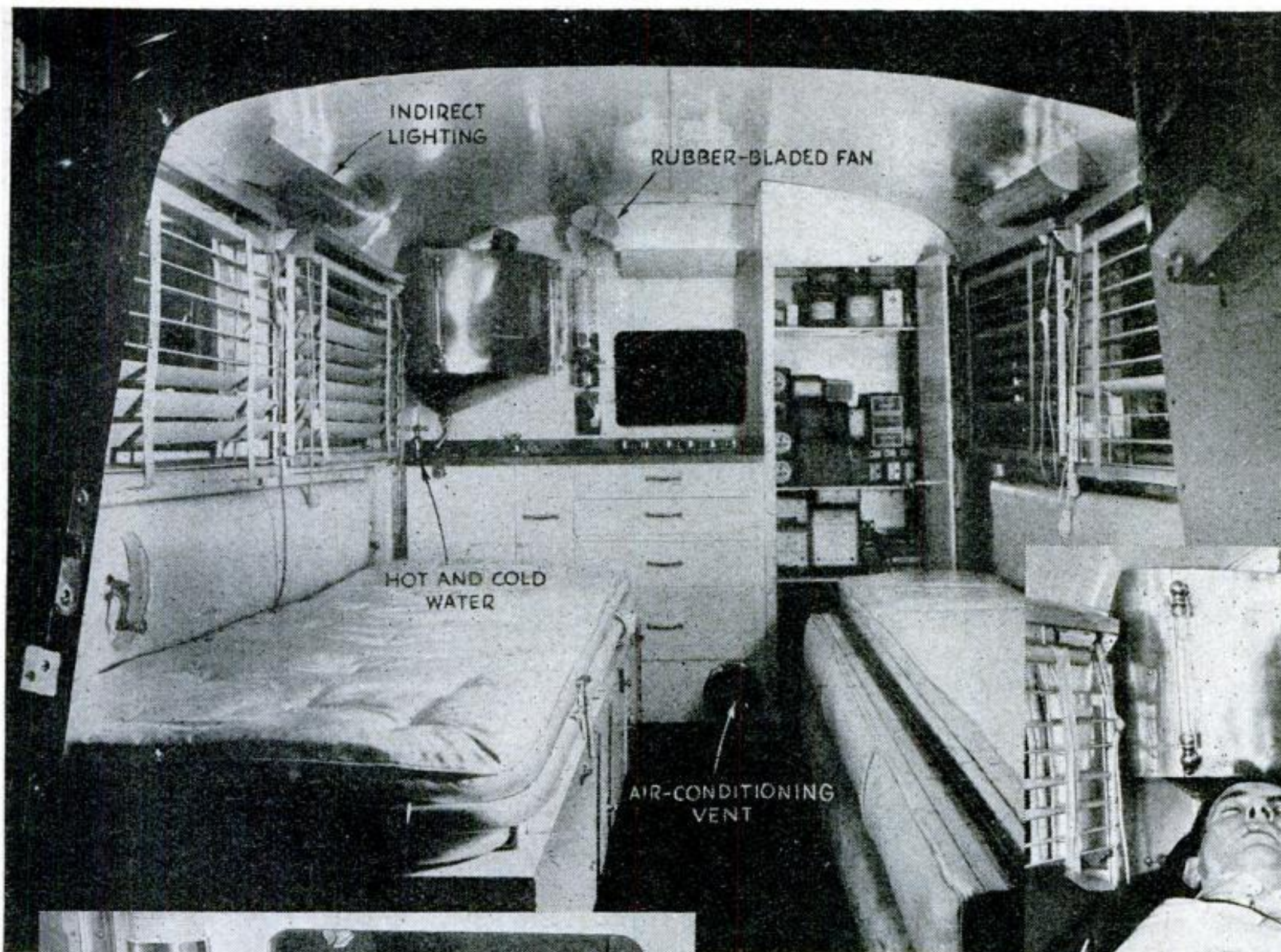
With funds raised last year by a pageant and show at Madison Square Garden, the new machine has been equipped with virtually every aid for saving lives and treating injuries sustained by firemen. Stationed near Borough Hall, in Brooklyn, it has a roving assignment, responding to every serious fire within an area of nearly 200 square miles.

Under the red, rakish hood of the 7,260-pound machine, a twelve-cylinder engine develops 110 horsepower. In emergencies, it will carry the ambulance at speeds up to a mile and a half a minute. Above the driver's compartment, a red searchlight swings from side to side automatically while the machine is in motion, providing a warning signal that can be seen for long distances. In addition to the regular headlights, special fog lights are carried to pierce mist and rain.



By  
**JOHN E. LODGE**

At the left is an interior view of the ambulance, showing the indirect-lighting system, Venetian blinds, and storage space for surgical instruments and supplies. Below, the surgeon is using a compactly designed gauge to take the blood pressure of a patient injured in line of duty



A complete assortment of surgical instruments, seen at left, is accommodated in drawers built into the body of the ambulance



If you slip into the seat behind the wheel of the new machine, you notice that everything is designed so one man can operate the siren, the bell, and the radio, as well as run the ambulance. Your knee presses against a plunger on the dashboard. This enables you to keep the siren going while you operate the throttle with your foot. Near-by is a second plunger. A jerk on this sets the heavy bell at the nose of the car clanging. Radio orders are picked up through earphones worn by the driver, and a two-way system, similar to that used on airliners, permits a running fire of orders and reports between the mobile hospital and the department's communications center located in Central Park, where it will be safe in the event of a city-wide conflagration.

It is the interior of the ambulance, however, that presents the greatest variety of novelties and makes it unlike any other machine of its kind. The rear door closes against a rubber cushion which seals the interior and permits air-conditioning. Two vents, one for cold and the other for warm air, enable the surgeon inside to regulate the temperature to suit the needs of his patient. The warm air comes from a chamber heated by water from the engine. Venetian blinds keep out the glare of the sun in the daytime, while ten 21-candle-power lamps—four on each side and two in front—provide indirect illumination for the interior after dark.

Behind the driver's compartment is a stainless-metal sink with hot (Continued on page 120)



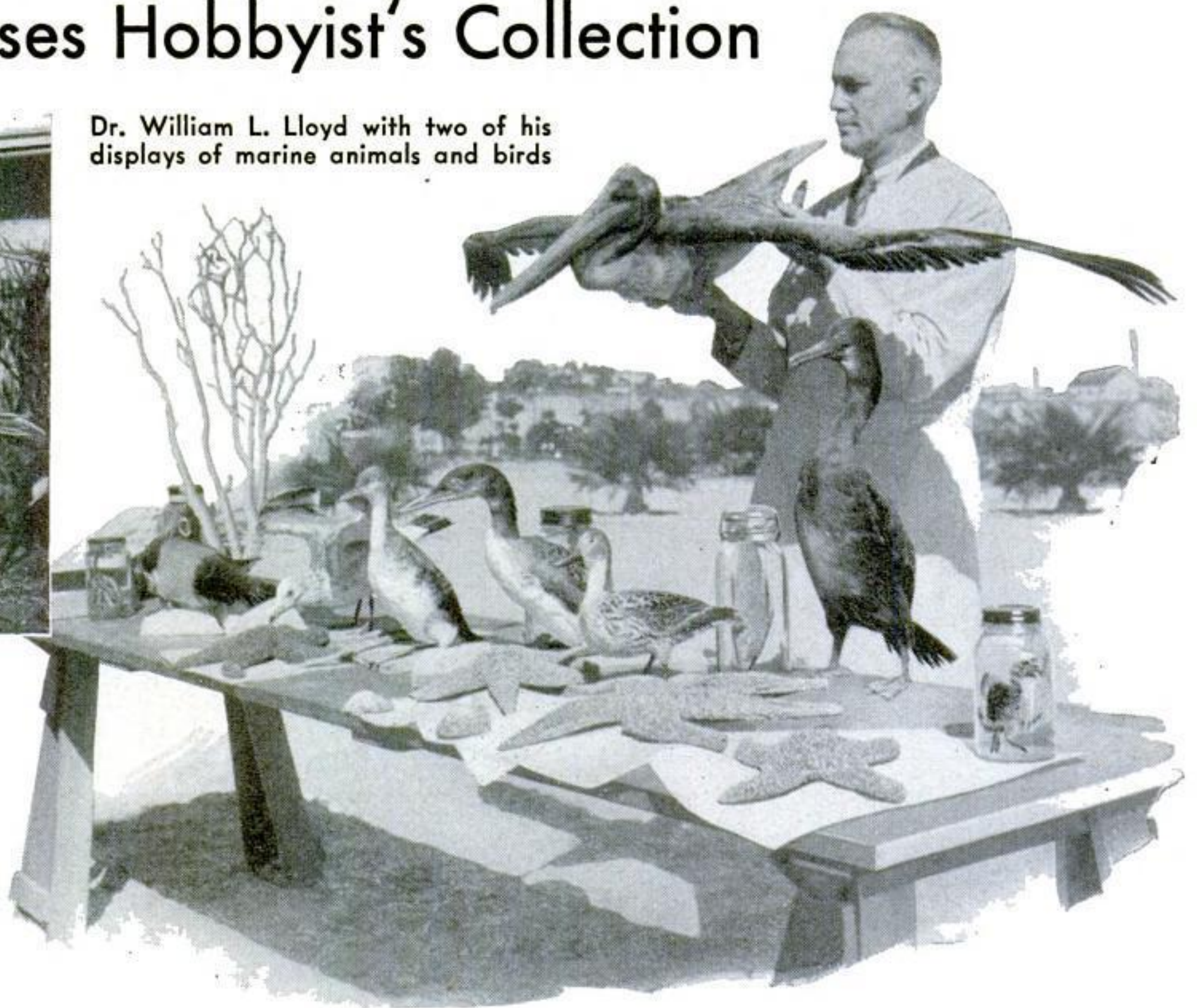
For treating large numbers of men who have been injured or overcome by the smoke in a burning building, equipment can be taken from the ambulance for use as illustrated at the left



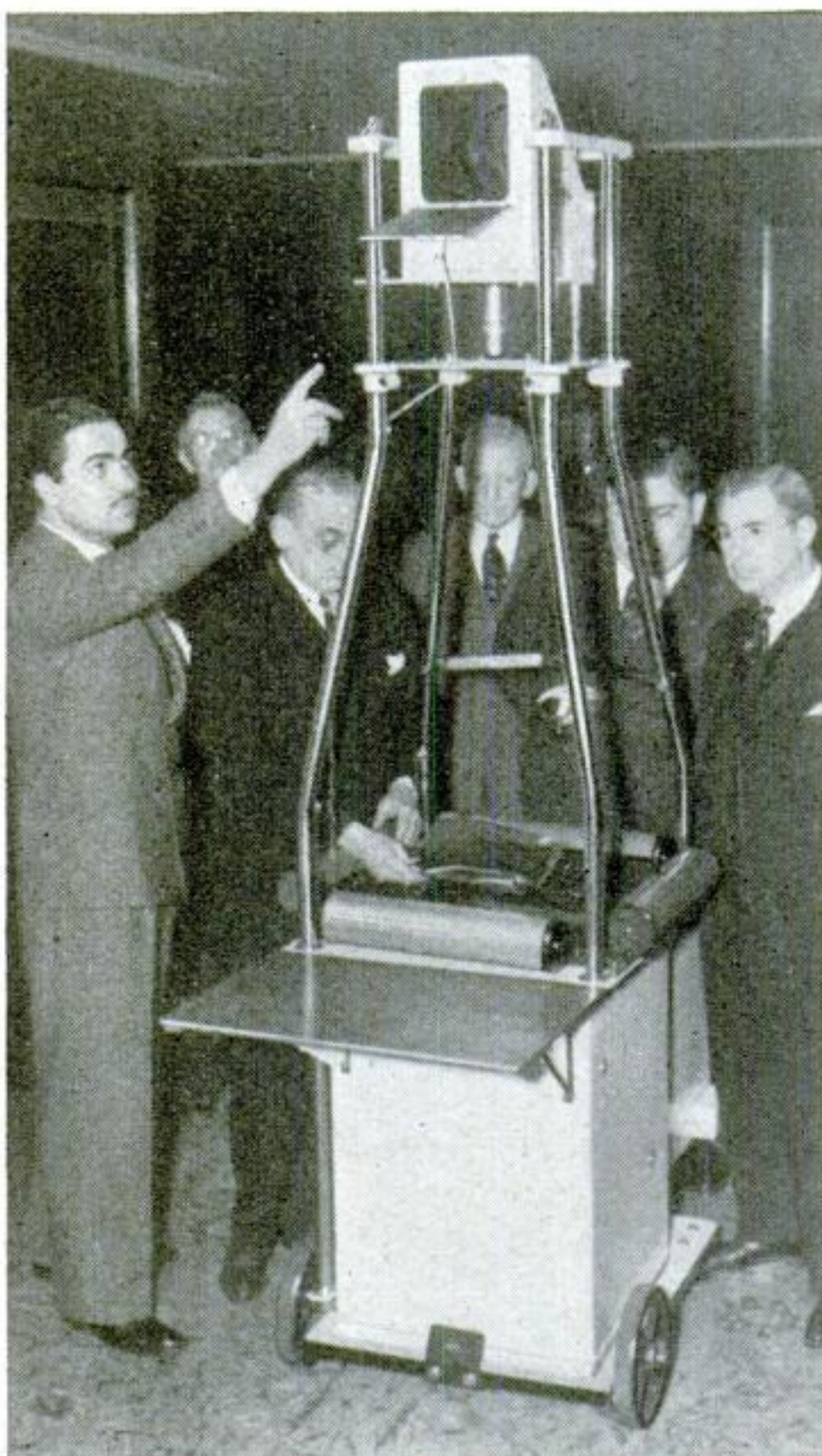
# Beach Museum Houses Hobbyist's Collection



Dr. William L. Lloyd with two of his displays of marine animals and birds



**A** BEACH MUSEUM at Cabrillo Beach, Calif., started as a hobby by Dr. William L. Lloyd, former University of Pennsylvania biologist, aids amateur naturalists to become acquainted with native wild life. His collection of marine animals and local birds now is maintained by the Los Angeles Playground and Recreation Department in attractive exhibits.

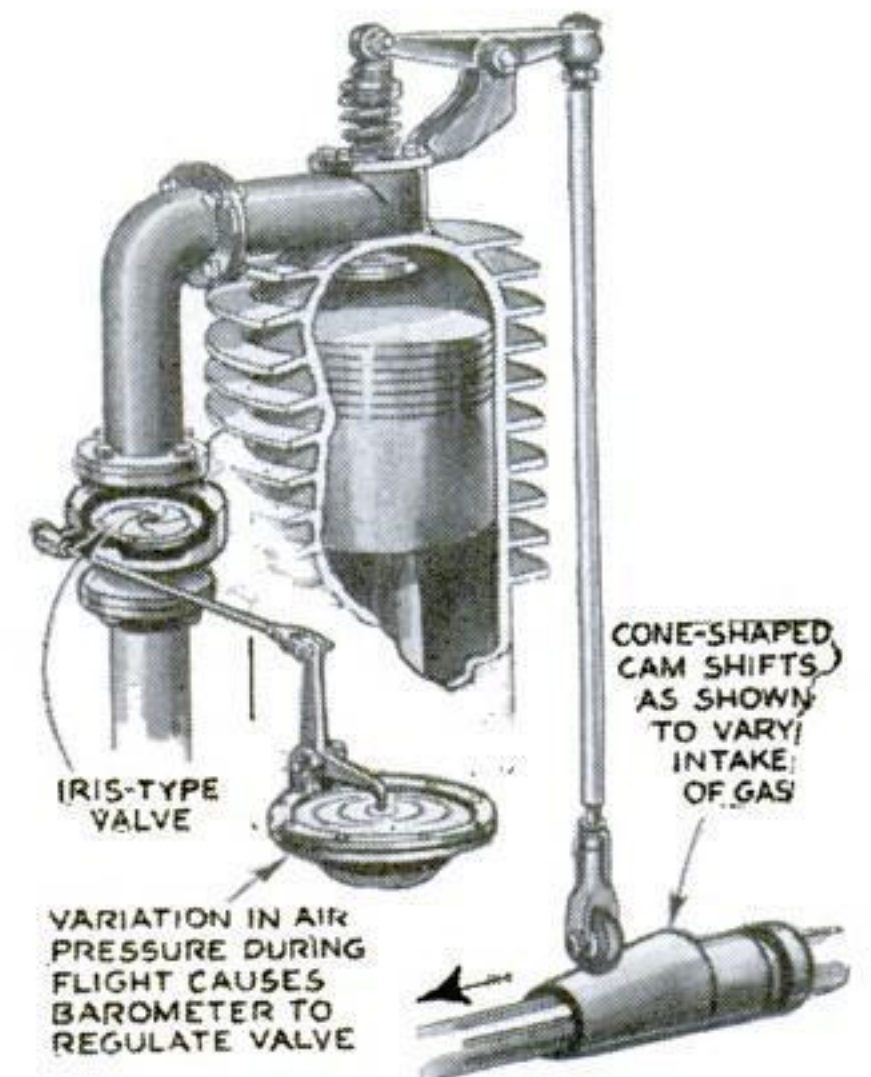


## Novel X-Ray Projector Aids Medical Students

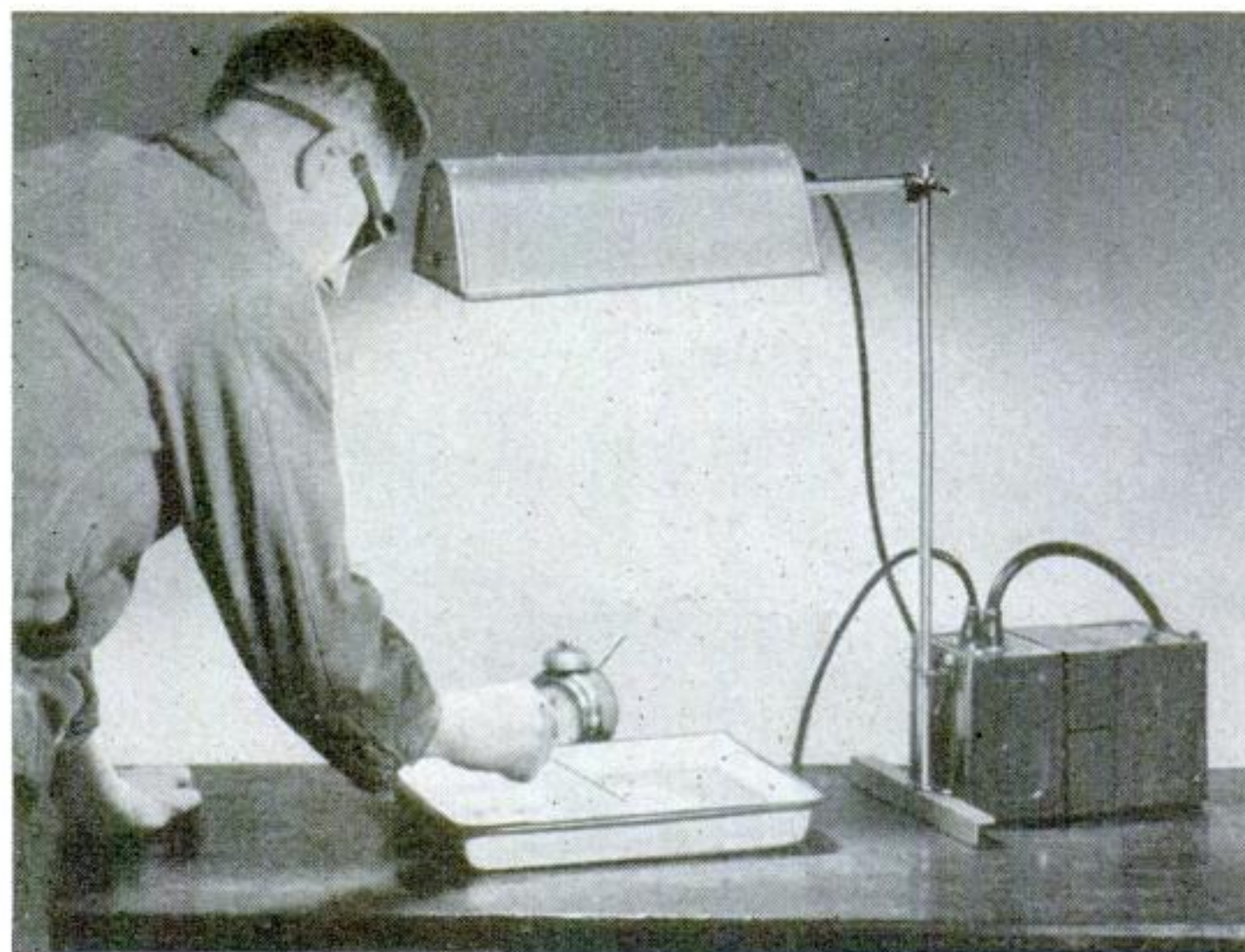
WATCHING a surgical operation becomes doubly instructive for medical students with the use of a new portable projector, shown above, for direct projection of X-ray pictures up to eleven by fourteen inches in size. Films made while the patient is actually being operated upon are rushed to the projector and the images thrown on a screen, so that the students can follow the surgeon's movements as clearly as if each were performing the operation himself.

## Airplane Motor Adjusts Itself for Altitude

WHETHER an airplane is flying a few hundred feet above sea level or at an altitude of 20,000 feet, there will be no appreciable variation in the power of its motors if they are fitted with a new intake control, according to the inventor, A. G. Squadrani, of New York City. To compensate for changes in atmospheric pressure with altitude, a lever actuated by a barometer automatically widens or narrows the opening of an iris diaphragm that governs the flow of the fuel mixture to the cylinders. In addition, the fuel charge admitted to the cylinder may be adjusted by regulating the intake valve, which opens wider and remains open longer when a camshaft is shifted in the direction shown by an arrow in the diagram. The result, the inventor maintains, is to provide an even flow of power, a cool motor, and a reduction in fuel consumption.



## Handy New Ultra-Violet Lamp Is Portable

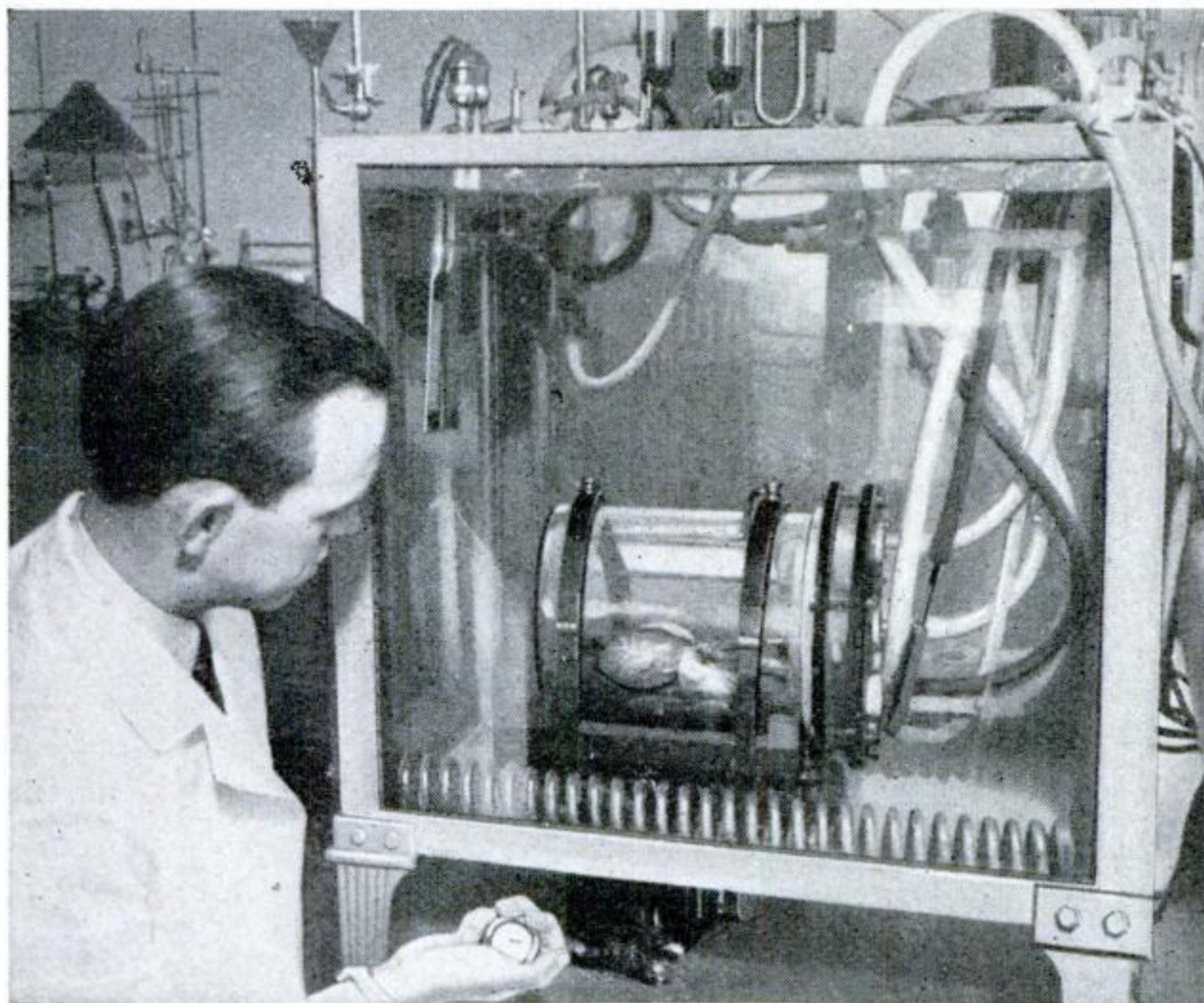


Mercury-vapor lamp in use to test effect of ultra-violet irradiation

A PORTABLE mercury-vapor lamp of "self-starting" design, operating through a compact transformer, provides a handy new laboratory source of ultra-violet light. Interchangeable filters adapt it for such varied purposes as making weathering tests on industrial materials, identifying fluorescent minerals, examining old paintings, revealing crime clues, and tests on germs and plants.

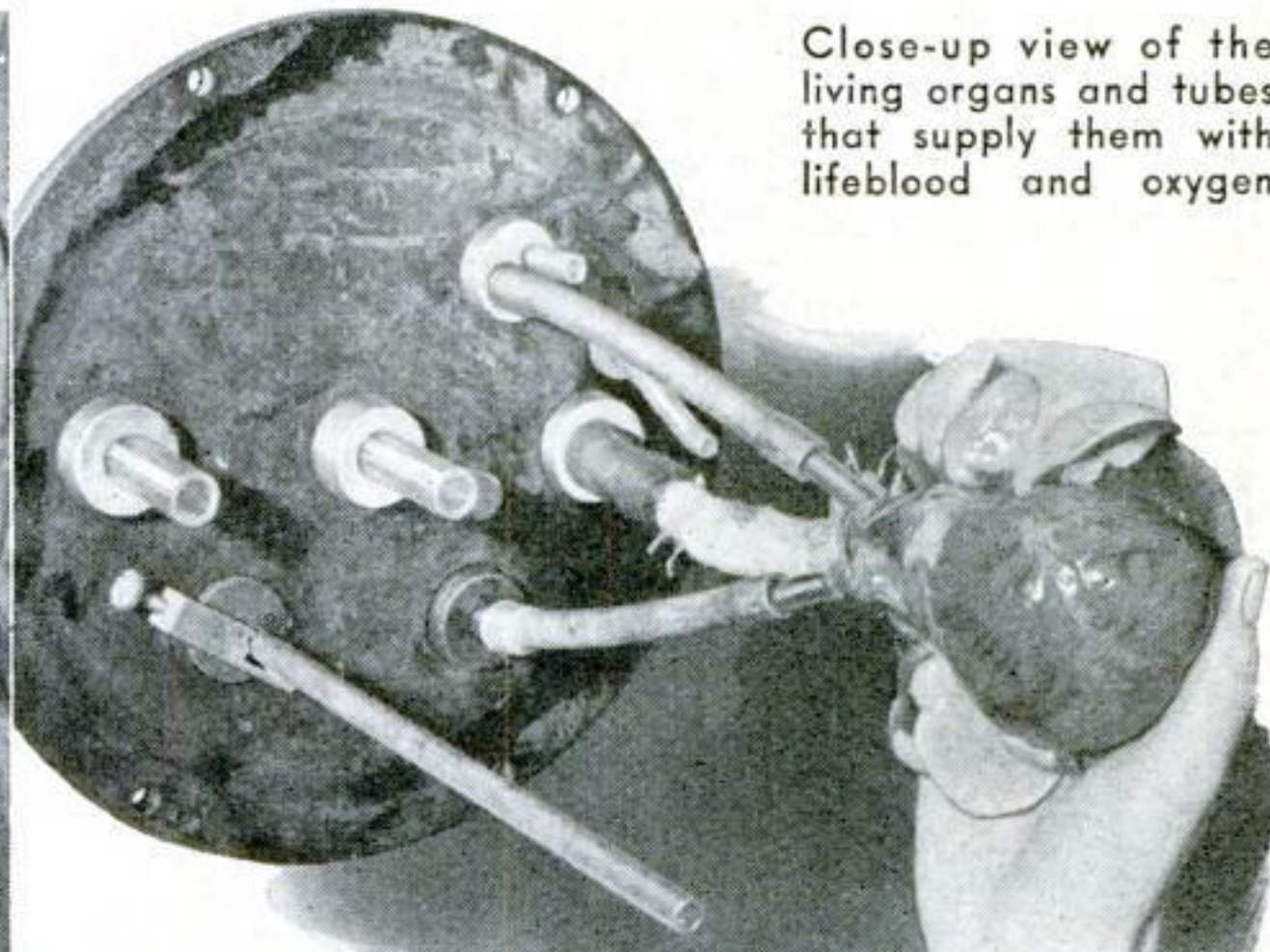


# Tests Made with Living Heart in Air-Tight Chamber

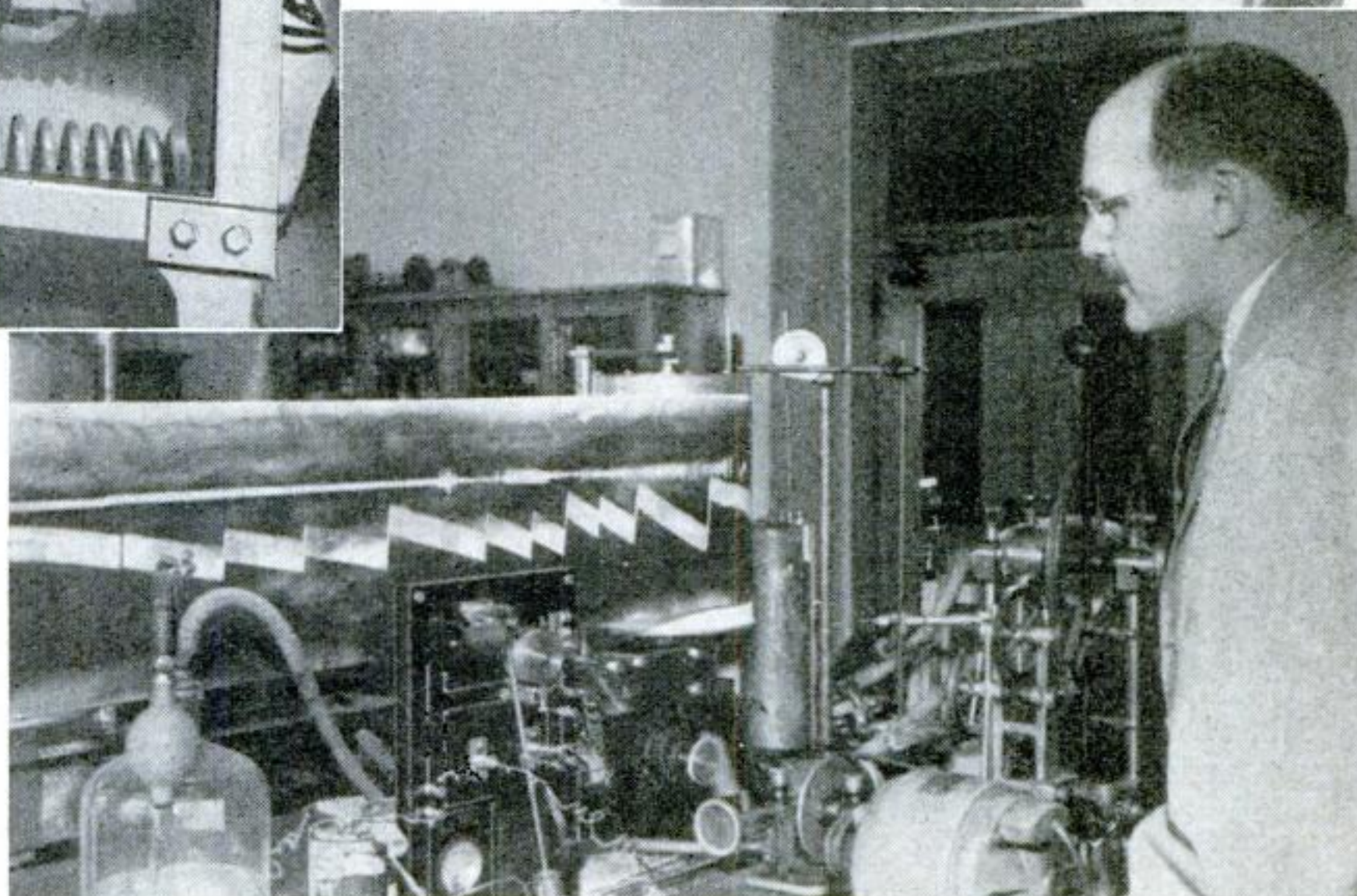


An assistant watching the action of a dog's heart and lungs connected to the artificial circulatory system

BY KEEPING the heart and lungs of a dog alive in an air-tight chamber, Dr. Maurice Visscher of the University of Minnesota recently demonstrated a startling new way to perform physiological experiments. Oxygen tubes kept the organs functioning normally while he injected drugs directly into the blood stream of the heart to study their effect. Meanwhile, delicate thermostats maintained a constant temperature within the outer water-filled tank, preventing variations that would affect the experiment or cause the "death" of the transplanted organs.



Close-up view of the living organs and tubes that supply them with lifeblood and oxygen



Dr. Maurice Visscher observing the reaction to drugs injected in the blood stream

## Snares of Coiled Wire Trap Tanks

COILS of ordinary wire, laid in the path of oncoming war tanks, are said to have proved their effectiveness as a barrier in recent British military maneuvers. The strands become enmeshed in the cleats of the tanks' endless treads, disabling the vehicles and rendering them an easy prey. Up-ended steel rails, planted in the ground, have also proved an effective barrier, while new antitank guns firing armor-piercing shells add to the wartime woes of the tank corps.



Tanks go all haywire when they hit this easily constructed barrier

Phil Spitalny, orchestra conductor, playing his novel candy-box piano



## Piano Case Is Transparent Cellulose

A PIANO encased in transparent cellulose instead of in wood has been constructed for Phil Spitalny, noted orchestra conductor. The innovation exposes the innermost workings of the instrument, whose tonal qualities are declared to equal those of a piano of conventional design.



# Acrobat Leaps to Glider Trapeze from Speeding Car

LEAPING from a speeding automobile to a trapeze bar suspended from a towed glider, a California daredevil recently performed a series of acrobatic stunts while the craft soared over the bed of Muroc Dry Lake. Drawn by a second car, the glider was maneuvered until the suspended trapeze was within reach of the acrobat's automobile. Leaving the car driverless, the dare-devil snatched the hanging bar and swung up into the air.

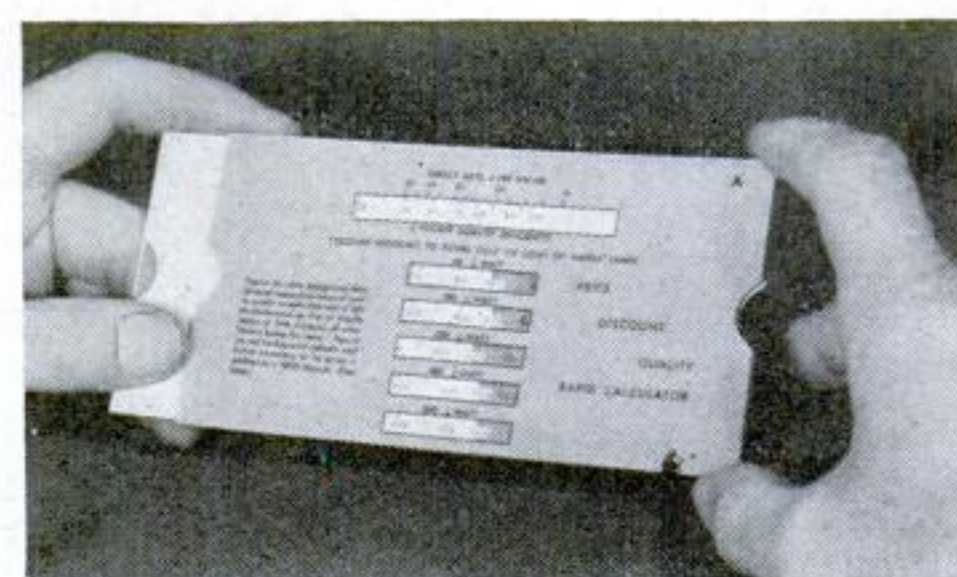


Watching for his chance, the acrobat in the speeding car grasps the trapeze bar and swings aloft under the glider

## Kit Has Parts for Making Clock

NEATLY arranged in a compact cardboard box, all the parts needed to make a decorative clock are included in a kit just made available. Gears and wheels are clearly marked to enable the novice to follow the instruction sheet in constructing an accurate timepiece. In the model illustrated in the photograph at the right, the one-piece dial is decorated with a painted ship.

Clock parts packed in a kit for amateurs. Right, a finished clock



## New Pocket Calculator Shows Lighting Costs

SMALLER than a postal card, an ingenious calculator is designed to aid lighting salesmen and buyers of large quantities of electric lamps in determining the relative cost of light, the energy wasted by inferior lamps of various wattages, and other pertinent data. Built on the principle of the common slide rule, the calculator has several sets of stationary and sliding scales which, correctly adjusted, furnish precise percentages and costs to show the economy of high-quality lamps.

## Card Keeps Golf Score

PERMANENTLY recording golf scores, a novel device has a hinged cover provided with conical hole punchers on its inner surface. Pressure on one of the numbers printed on the cover punctures the same number on a score card.



## Machine Applies Concrete to Pipe in Trench



After the concrete is applied, a workman smooths it out with a hand trowel

The novel machine in action applying a coat of concrete to pipe in a trench

PROTECTIVE layers of concrete or plastic material are spun onto cast iron or steel pipe set in trenches, by means of a pipe-coating machine invented by Thomas H. Wilson, of Los Angeles, Calif. Powered by a small gasoline engine that drives a steel drum surrounding the pipe, the machine smears on the coating material under pressure. As concrete is applied, the device automatically moves along the pipe. Concrete coatings are sprayed with asphalt to prevent rapid setting.





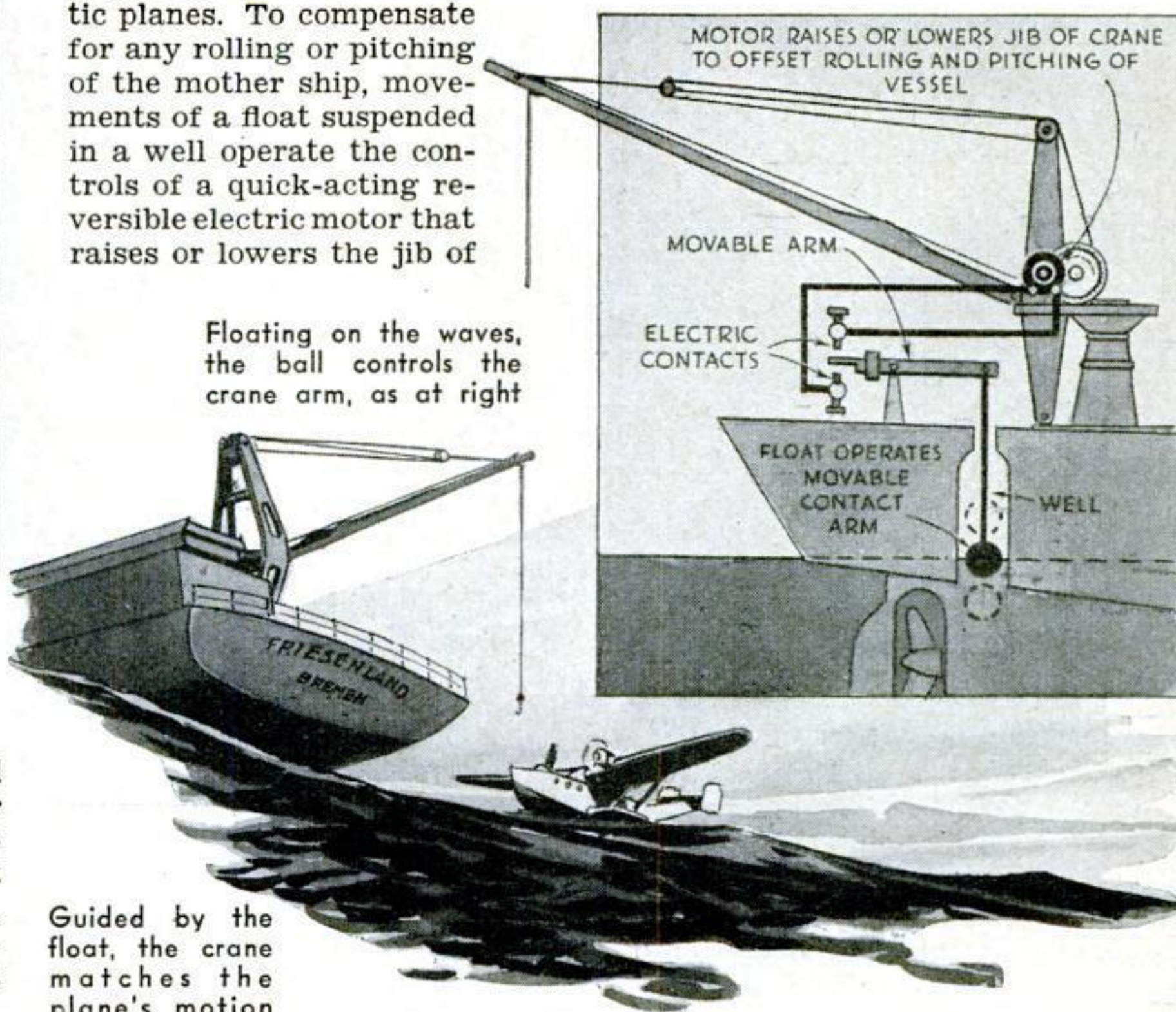
## Air-Line Hostesses Learn Low-Down on Make-up

FLYING is not all a matter of machinery and weather reports, as would-be hostesses for transcontinental airliners learn in their specialized training schools. Even lessons in "flight make-up" are a part of their varied curriculum, and one of them is shown above getting instructions from an expert on how to apply a few deft touches to obtain a well-groomed effect.

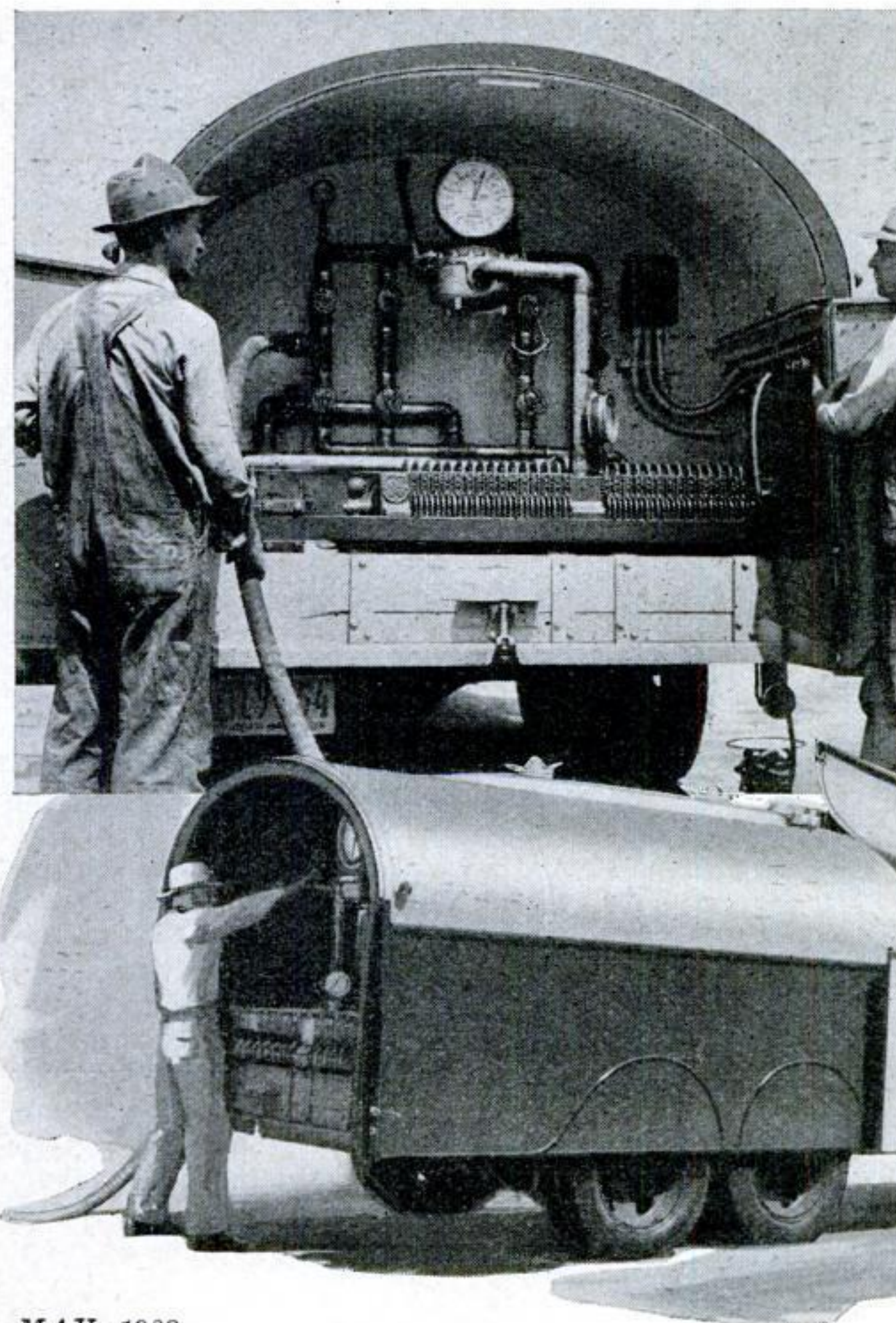
## Self-Leveling Crane Lifts Seaplanes

AUTOMATICALLY leveling itself, an ingenious crane has been designed to pick up seaplanes alighting beside the steamship *Friesenland*, one of the floating airports that Germany has stationed in mid-ocean to serve as a half-way stop for transatlantic planes. To compensate for any rolling or pitching of the mother ship, movements of a float suspended in a well operate the controls of a quick-acting reversible electric motor that raises or lowers the jib of

the crane accordingly. Thus the crew of the plane can secure it to the dangling hook without danger of being pitched into the water or of having their craft damaged by a sudden lurch of the *Friesenland*. Details of the novel self-leveling crane are pictured in the photographs reproduced below.



## Pump Truck Cleans Oil In Transformers



CLEANING the oil that serves as an insulating and cooling medium in huge electrical transformers is made a speedy and simple process by a service truck in use at Los Angeles, Calif. Electric pumps on the truck suck the oil from the apparatus and force it through a large disk of filter paper at the rate of sixty gallons a minute, returning it freed of impurities.

Transformers located in outlying districts can be quickly serviced by this truck



## Four-In-One Foot Warmer Fits Under Card Table

BRIDGE players may concentrate upon their bidding, undisturbed by chilly drafts along the floor, when a new electric warming mat is plugged into any convenient outlet. Designed to fit beneath a card table with one leg of the table on each corner to hold it in place, as illustrated above, the appliance provides four individual heating pads enclosed in pockets for the players' feet.



By EDWIN TEALE



Prof. George J. Keller, of State Teachers' College, Bloomsburg, Pa., with one of the two Canadian lynxes included in his private collection of wild animals

"Everyday is circus day at Keller's," they say in the twenty-foot steel arena at his "Jungle Farm." On

# Wild Animals

## ...COLLEGE PROFESSOR RUNS A

ONE of the most amazing back yards in America lies in the outskirts of Bloomsburg, Pa. Lions and leopards, bears and wolves, lynxes and cougars, inhabit it. There, when classes at State Teachers' College are over for the day, Prof. George J. Keller, instructor in art, spends his spare time training ferocious beasts as a hobby. Many graduates of his back-yard menagerie appear in vaude-

ville, circuses, and motion pictures.

A few weeks ago, when I drove over to see him, I found him unpacking a crate which had just come from Oregon. It contained a grumbling black-bear cub which Keller named Grumpy. Distributed around the yard were six-

teen sheds and cages. They held Rajah, an African lion; Satan, an Indian leopard; Lucifer and Lucy, a pair of Canadian lynxes; Adam and Eve, two Rhesus monkeys; Bobby, an albino raccoon; Tao and Tina, mountain lions from Nicauragua, as well as eagles and hawks, husky dogs, and even a badger that flattened itself and snarled continually when anyone approached.

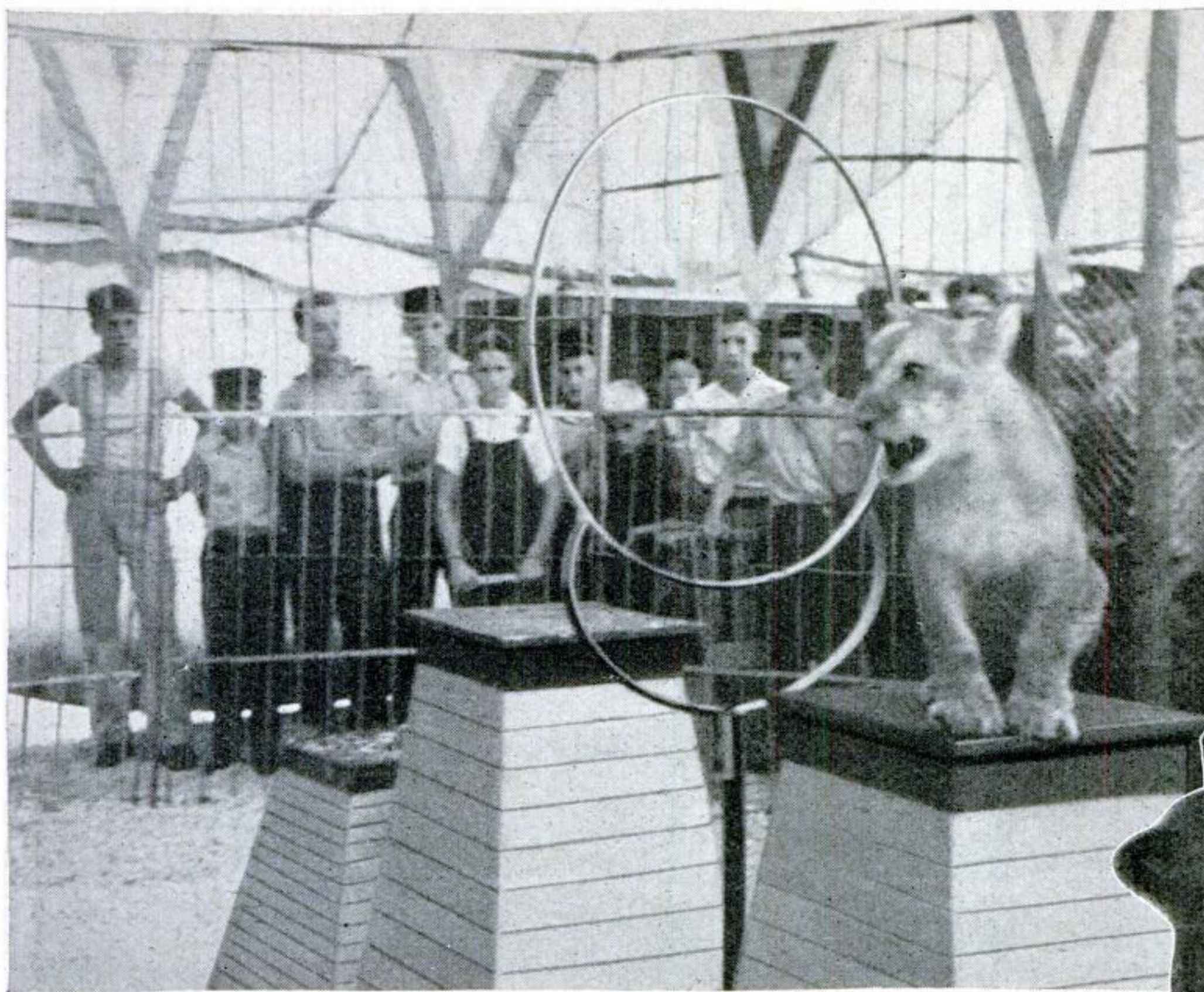
Altogether, Keller has more than \$1,500 worth of rare birds and animals in his private zoo. He usually buys new ones in the spring, trains them during the summer, and sells them in the fall. He works twice a day, during the summer months, in his twenty-foot steel arena, once at about eight o'clock in the morning and again at seven in the evening. On Sundays, there are often as many as 150 automobiles parked along the road near his home, and last summer, when he established a "Jungle Farm" on one of the main highways leading out of Bloomsburg, 17,000 people visited it to watch him in action.

The greatest excitement occurs during the "mixed acts." Right now, Keller is working on a spectacular display in which an African lion, three mountain lions, a bear, and a leopard will perform in the same ring together. They will ride on rolling balls, jump through blazing hoops, balance on ped-



Here is Keller with Nina, his five-year-old golden eagle from Colorado. Though he had never tried to train a bird before, in nine months he taught Nina to hunt like a falcon





Bloomsburg. Here the amateur trainer is giving Rajah, his African lion, a workout summer Sundays, there are often as many as 150 automobiles parked near his home.

A favorite inmate of the home zoo is Grumpy, the black-bear cub seen below at lunch. Grumpy's fame has spread far beyond Bloomsburg since his petulant growl was broadcast on a nationally known radio program



# Are His Hobby

## CIRCUS IN HIS BACKYARD

estals, and ride on a giant seesaw. Working up such an act requires months of intensive training and is divided into four stages.

The initial step is to get acquainted with each of the animals. Every beast has its own individual characteristics. Keller alone feeds them. For weeks, he studies them and plans the best angle of approach. As a general rule, the members of the cat family, including the lions and tigers, respond only to fear. Dog performers, on the other hand, will act to please their master. Keller rates the different animals thus: Cats are the biggest bluffers; dogs are the most intelligent; bears are the most erratic and unpredictable.

Once, when Keller was in the arena with two young bears, he dropped his whip. As he leaned down to pick it up, one of the animals, without the least evidence of anger, reached over and whacked him on the head so hard that he saw stars. It seemed to be its idea of having fun.

The closest call that Keller has had in ten years of amateur animal training came one evening when he was putting a trio of bears through their paces. He had been rehearsing them for a "Goldilocks and the Three Bears" act. Gruff, a 150-pound male, was taking the part of the middle-sized bear.

As it climbed down from its pedestal at the end of the act, it suddenly whirled and charged across the arena toward Keller, squealing with rage and clawing the air with its great forepaws.

Quickly twisting his whip butt-uppermost, Keller swung between the flailing forepaws and struck the animal on its most sensitive point, the end of its nose. This stopped it momentarily. The trainer followed up the attack with other quick taps on the nose. The bear changed its mind, turned, and climbed back on its pedestal.

It is rarely that a trainer strikes an animal with his whip. The lash is used mainly for cracking as a signal. The revolver which Keller always carries into the arena, is loaded only with blank cartridges. It is fired in an emergency, not to hurt the animal but to confuse it for the time being and make it forget what it had started to do. *(Continued on page 124)*

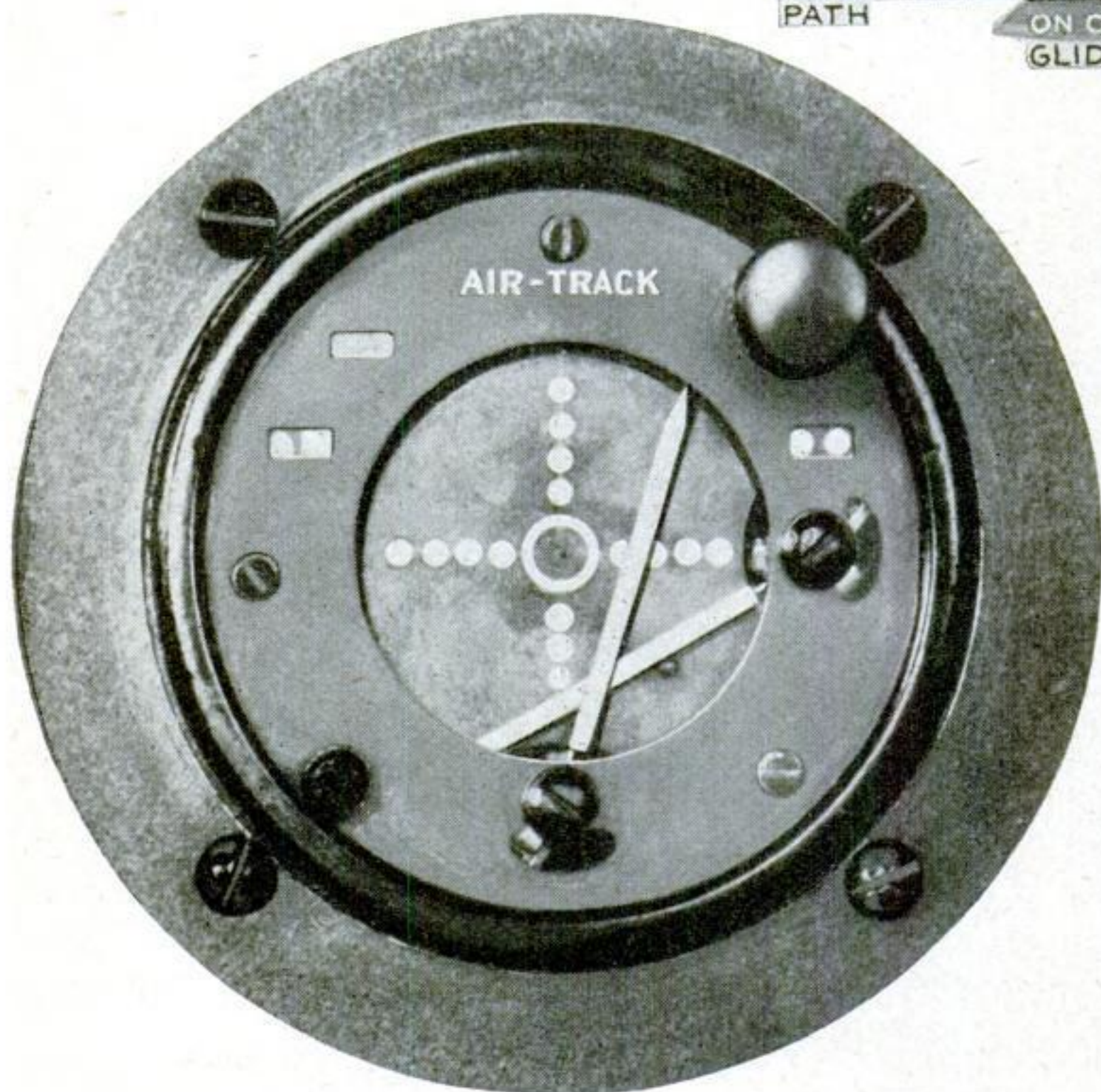
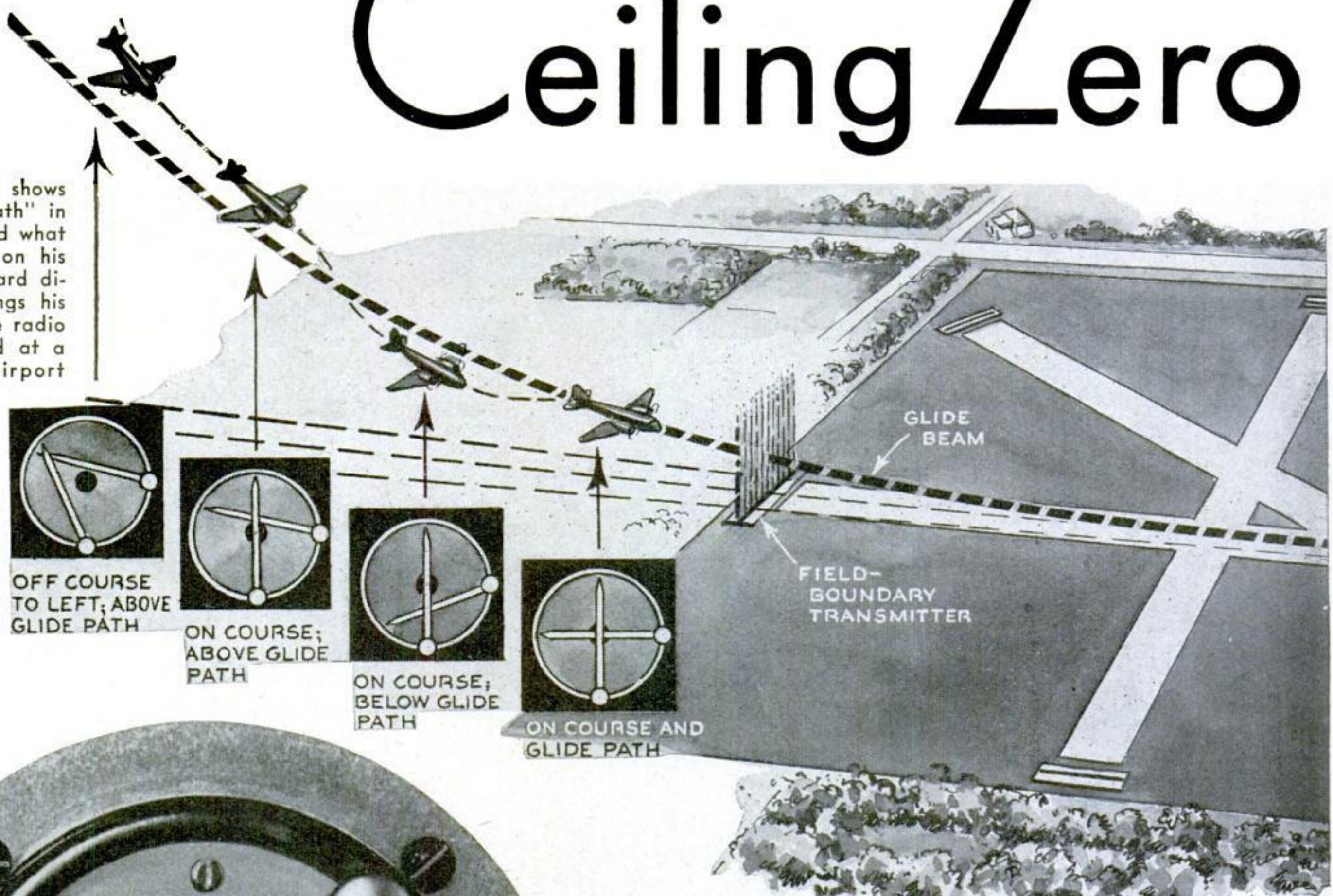


Simba, the cougar. This 170-pound Arizona mountain lion provided one of the greatest thrills that Keller has known



# Ceiling Zero

This drawing shows the "glide path" in operation, and what a pilot sees on his instrument-board dial as he brings his ship down the radio beam to land at a fog-bound airport



The vertical pointer shows whether the plane is to right or left of the beam, the horizontal one whether it is above or below



Men in the control tower of the airport order the mobile transmitting unit into action to assist in making the blind landing

By **ROBERT E. MARTIN**

**W**INGING its way through leaden skies, a great airliner is making port. Up forward, the copilot picks up the microphone of his two-way radio and asks for a weather report. "Ceiling zero—visibility zero!" comes the voice of the radio operator at the airport control tower.

Fog has suddenly rolled across the landing field, blotting out runways and hangars in a white pall through which the plane must dive to earth. Now it must be a blind landing, guided only by the dials on the pilot's instrument board.

Experimentally, the feat has often been performed by Army, Navy, and commercial flyers. Now, for the first time, passenger-carrying airliners on regularly scheduled flights are doing it. A few weeks ago, at Pittsburgh, Pa., a transport plane successfully inaugurated a radio blind-landing system perfected for the purpose after ten years of experimentation by experts of the Washington Institute of Technology, the National Bureau of Standards, and the Bureau of Air Commerce.

The heart of this new system is a radio transmitter housed in an auto trailer. Allowing ample time before a plane is scheduled to arrive at the airport, a runway is chosen that will al-

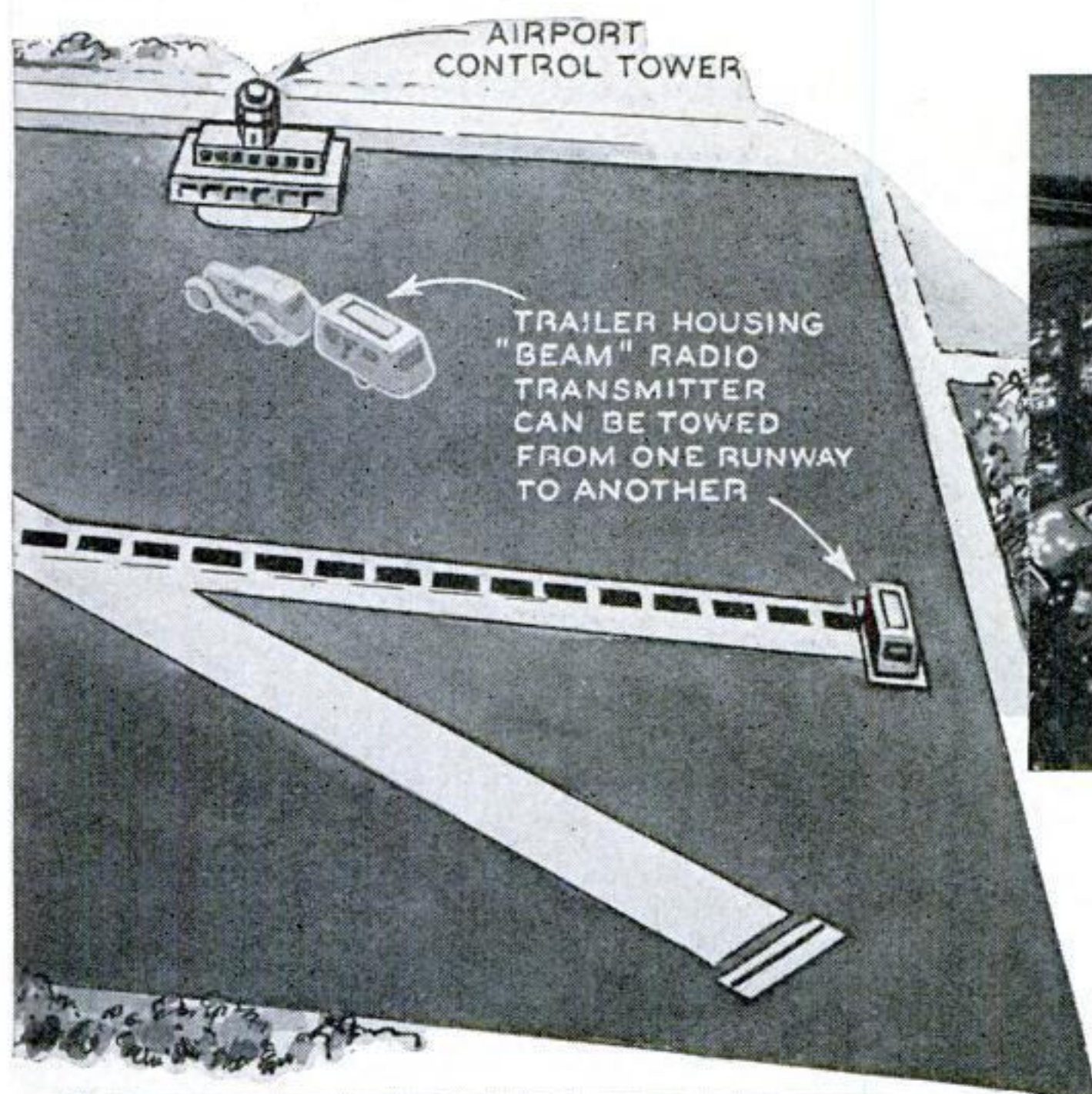
low it to land into the wind, and telephoned instructions from the control tower dispatch the trailer to this end of the field. Along the direction of the runway, the transmitter projects directional radio signals in what is called a "course beam."

Twenty miles from the airport, a pilot who has been following the regular long-range radio beacon first picks up the local "course beam." A vertical pointer on an instrument-board dial shows him whether he is flying to the left or right of it by swinging in the corresponding direction, and the pilot corrects his course accordingly.

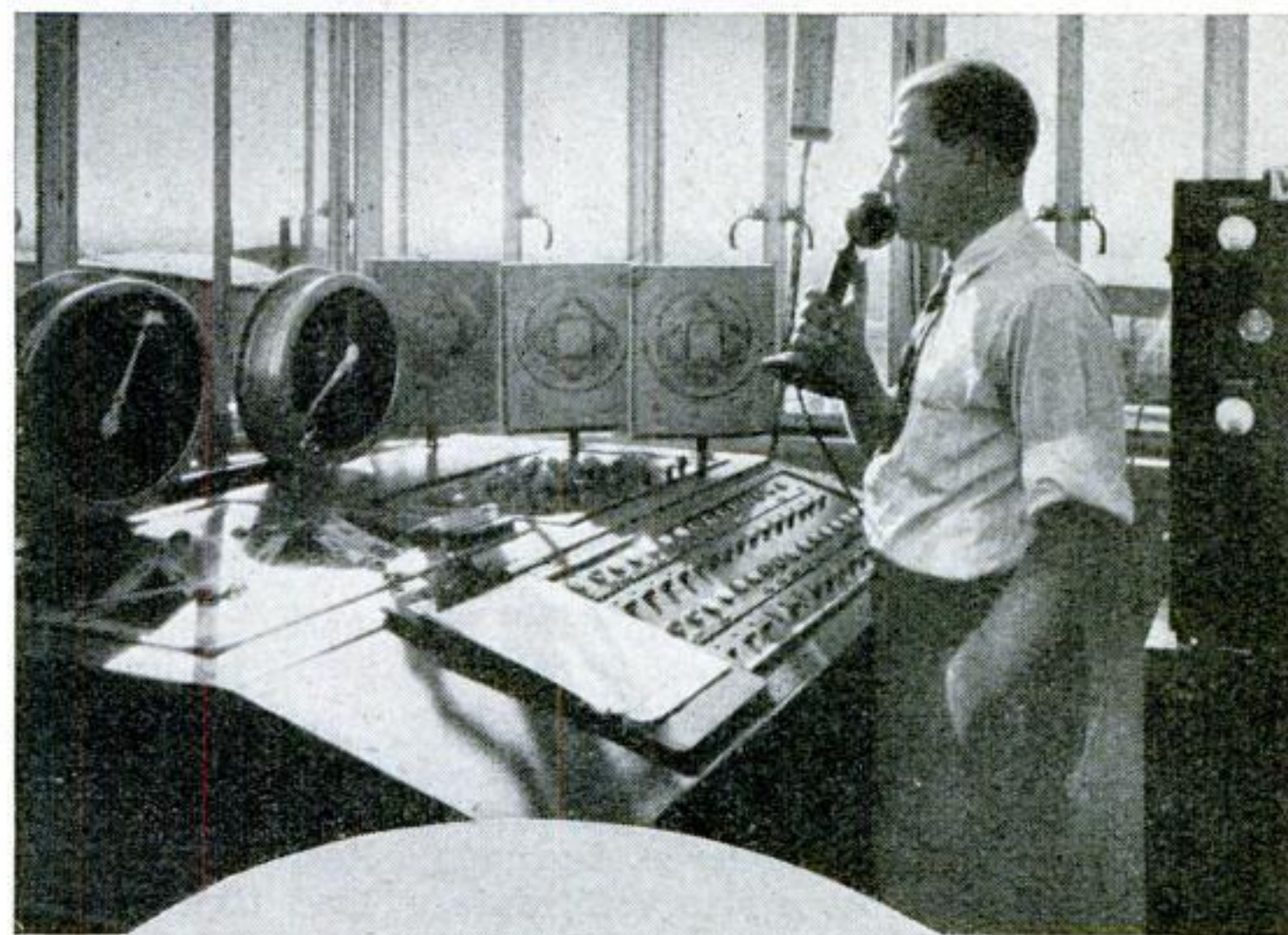
Four miles from the airport, a horizontal pointer on the same dial comes



# NEW RADIO SYSTEM GUIDES PLANES TO BLIND LANDINGS



In the cockpit of the incoming plane, the co-pilot receives a weather report from the radio operator at the airport, below. Fog has closed in. "Ceiling zero—visibility zero!" comes the warning. The plane must make a blind landing, by instruments only



The trailer housing the radio-beam apparatus is towed to the end of a runway on which the plane can land into the wind



After gliding down on the runway, the big airliner taxis up to the apron and discharges its passengers. The blind landing has been made in safety

into play. By rising or falling, it indicates whether the plane is above or below a curved "glide path," marked by constant intensity in a field of radio waves projected by the trailer, and leading down to the earth from an altitude of 1,500 feet at just the right gliding angle.

Keeping the two pointers centered, the pilot thus heads his plane for the runway at the proper rate of descent, just as if the craft were coasting on trolley wheels down a guiding cable. A final radio warning from a fixed "marker beacon" at the boundary of the field—a tone signal in his earphones, and a flashing light on his instrument board—tells him that he is about to land. A few seconds later, the landing wheels gently graze the earth. After a brief run, the plane taxis up to the apron and the passengers disembark, brought safely to their destination by the magic of modern radio.

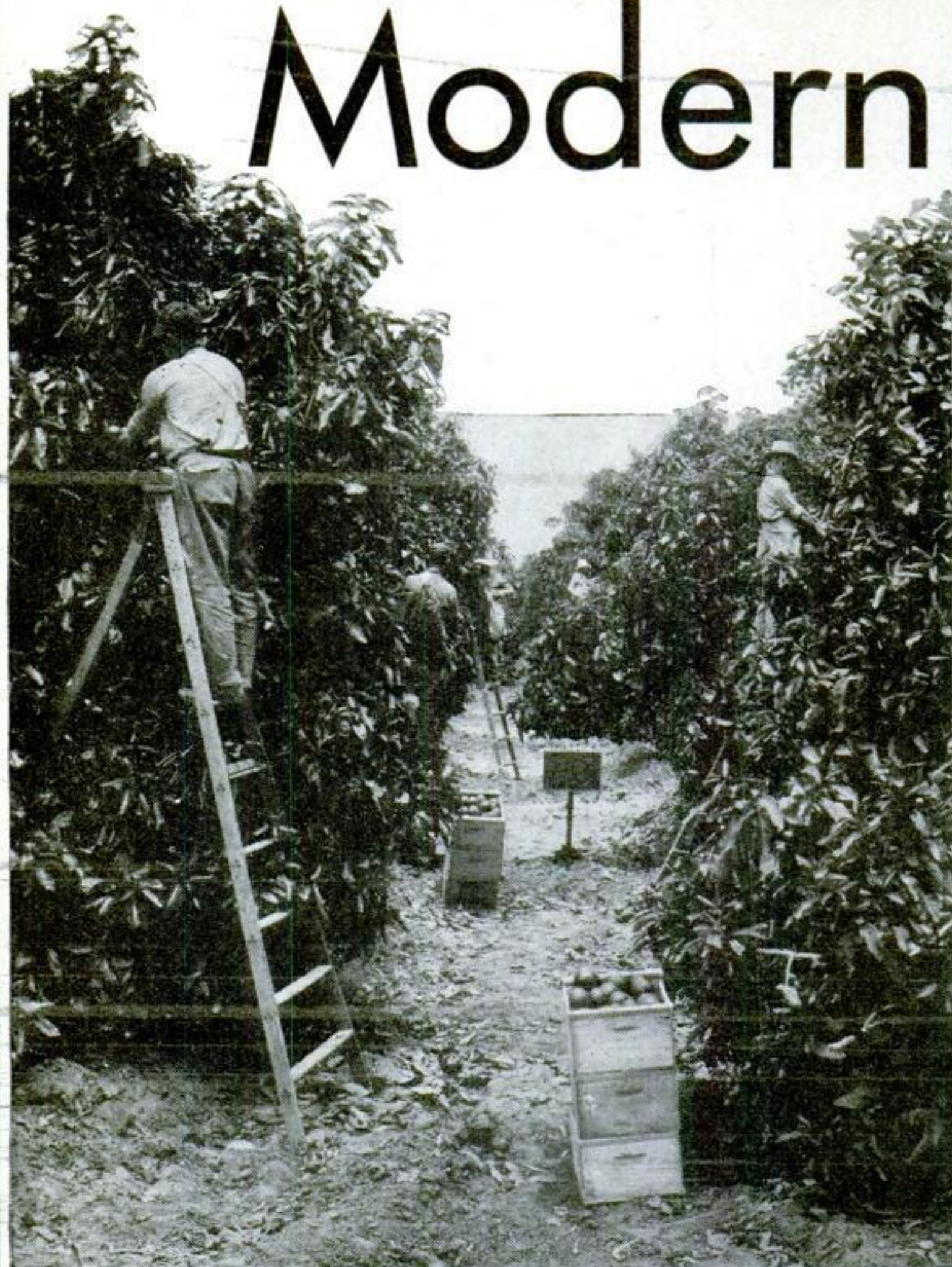


# Modern Avocado

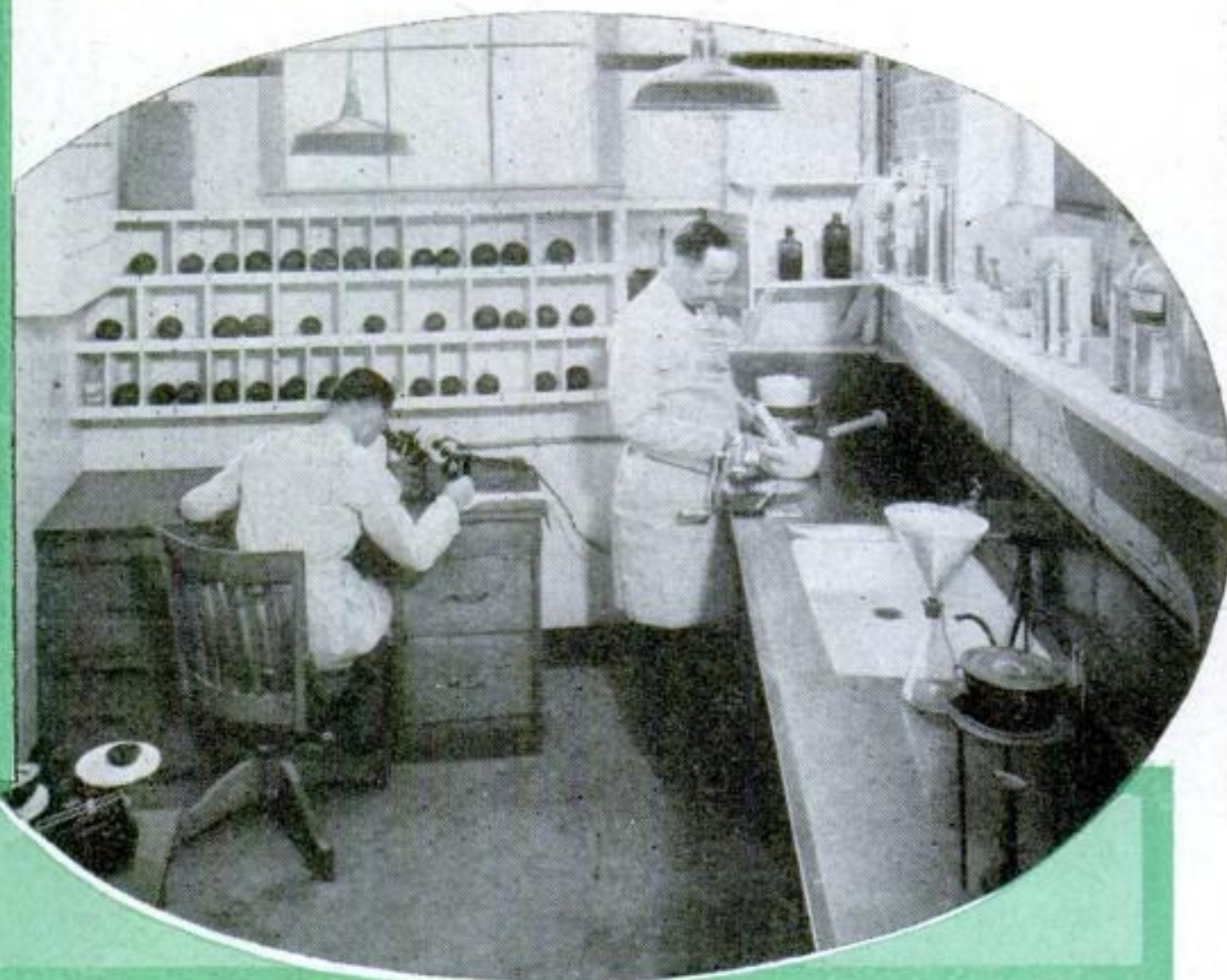
Explorers, Scientists, and Growers  
Have Joined Their Efforts To Master  
the Strange Behavior of This Relic  
of Mayan and Toltec Civilizations

By

ANDREW R. BOONE



Workers gathering avocados in a California grove. At the right, chemists at the packing plant are testing sample fruit for its oil content



FROM 15,000 acres of groves in Florida and California, 20,000,000 avocados, or alligator pears, will roll this year in refrigerated trucks and railroad cars to the markets of the nation. Although it was cultivated by the Toltecs and Mayas of Mexico and Central America, this delicious fruit is little understood today, even by the small group of scientists and growers whose patient efforts have brought it to your dinner table.

How the ancient Americans propagated avocados remains a mystery, yet this fruit, one of the few contributed by the Western Hemisphere, was cultivated hundreds of years before Columbus. The Toltec and Mayan civilizations disappeared nearly ten centuries ago, yet among their ruins wild and domestic avocados are found growing side by side—varieties differing as widely from each other as the wild apples of the Himalayas and the delicious apples of the United States.

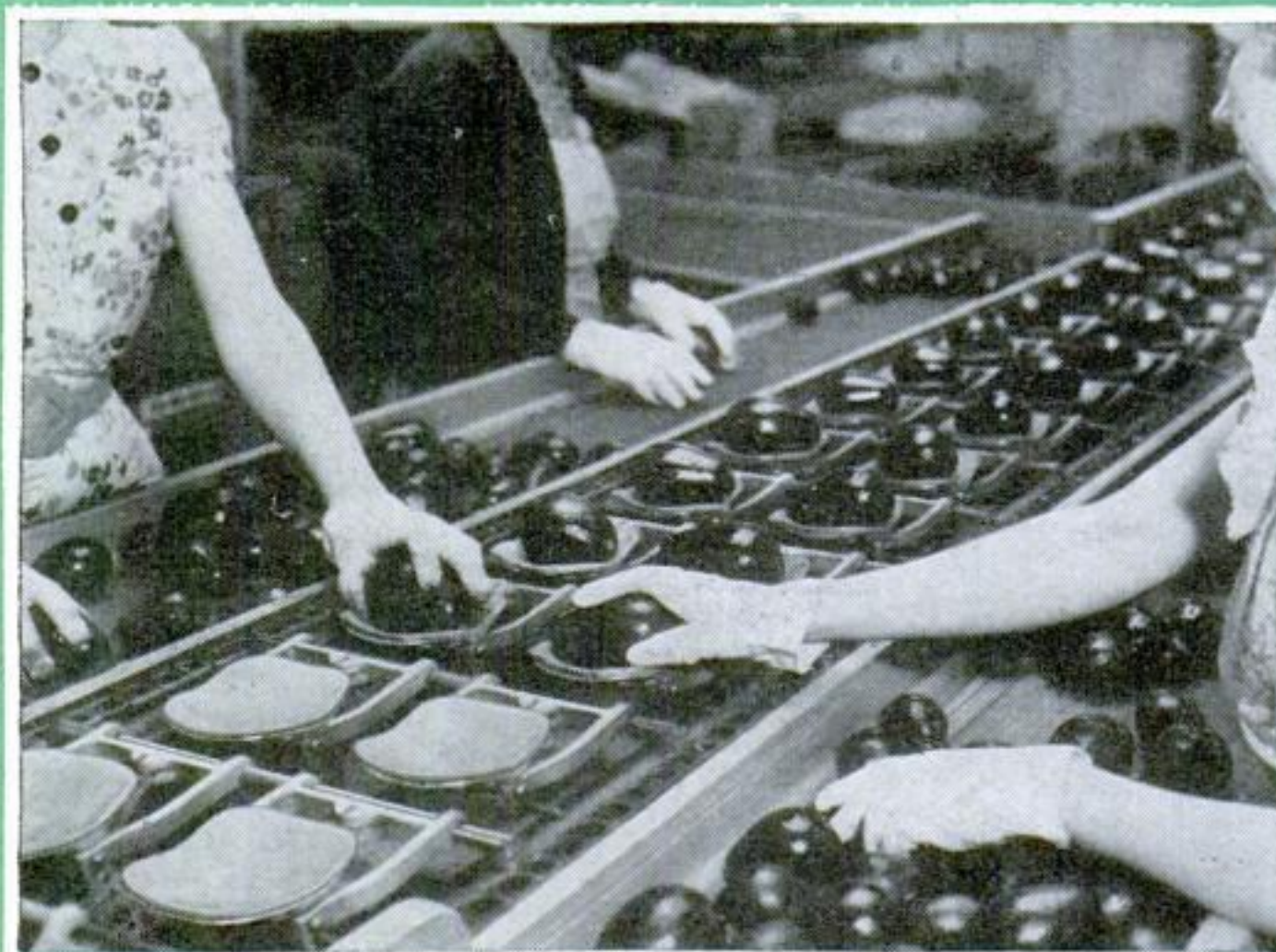
More than 30,000 varieties of avocados have been counted. Of these, 518 have been named and selected for experiment, and about two dozen kinds are being raised commercially in Florida, California, and Hawaii. And, in an orchard at the University of California in Los Angeles, avocado seed-

lings have been planted so that, for the first time in history, their mysterious life processes can be checked scientifically.

At the present time, there is no way of telling whether the seeds of a given variety of avocado will grow into a tree of the same type, or of an entirely different kind never seen before. Nearly all the avocados consumed in this country today are produced by grafting bud wood from trees of known quality, found by explorers in tropical and subtropical jungles, onto the roots of seedlings. And even with this foolproof method of controlling variations, the trees exhibit peculiarities that distinguish them from all other fruits.

In the first place, millions of blossoms form on each tree from Novem-

ber to May, in the climate of California. Of these, generally only a few hundreds will bear fruit, though sometimes a single tree will produce 35,000 avocados, with a total weight of four tons. Trees have been known to collapse under the weight of their fruit, but the average yield for each tree



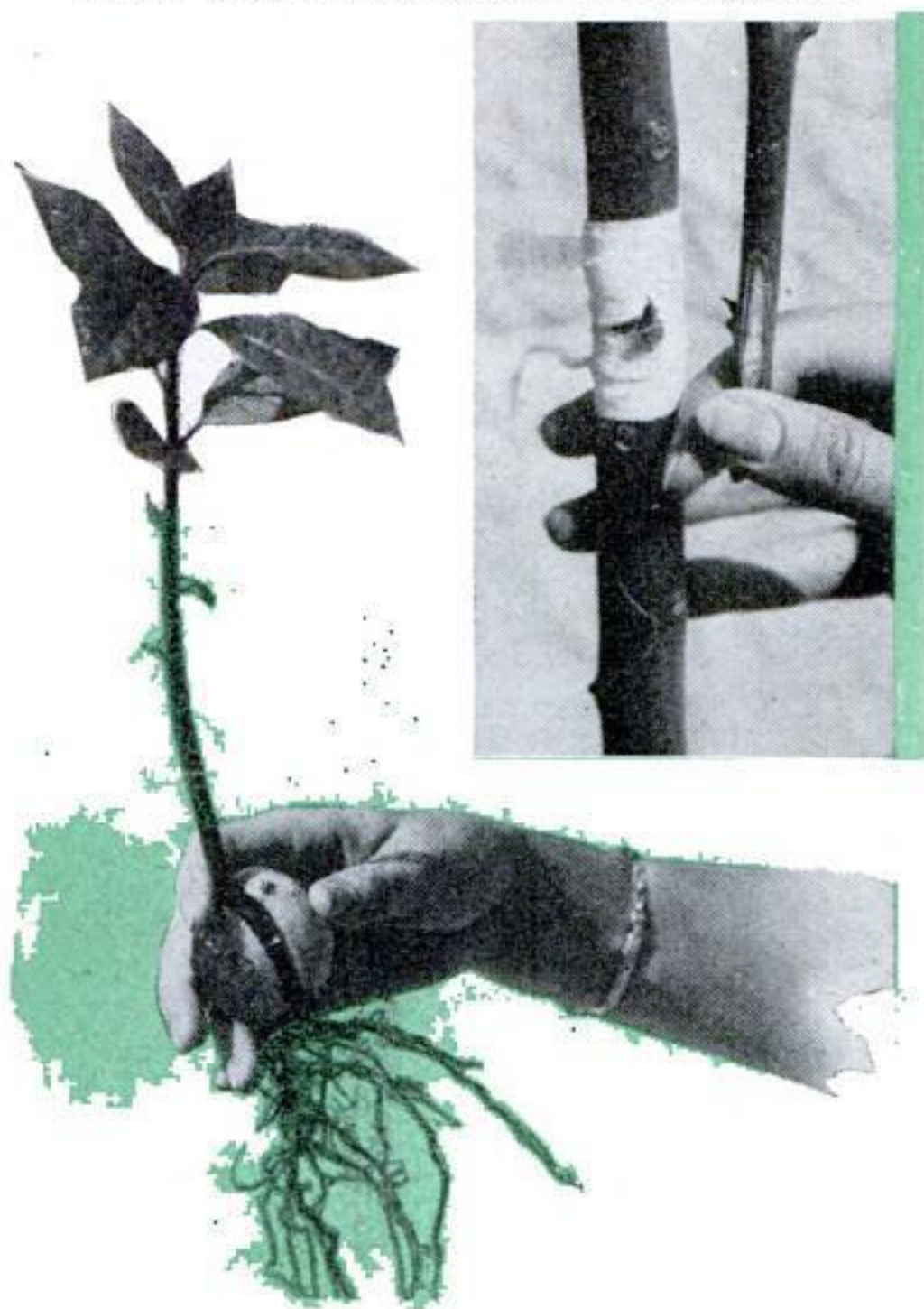
Graders placing selected fruit in rubber cups on a conveyor which passes them under a machine to stencil on a brand name



# Groves

## BRING AN ANCIENT FRUIT TO YOUR TABLE

At the left, below, is an avocado seedling. Inset shows how bud wood from a tree of known quality is grafted onto a root stem



A scene in a California packing plant where avocados are prepared for shipment to all parts of the country. Easily bruised, the fruit are handled as carefully as eggs

scarcely touches 600 pounds in weight.

Each flower opens and closes four times during its lifetime, almost with the regularity of clockwork, changing sex three times in the process. Female organs mature first, and on the first opening the flower functions as a female. From six to twelve hours later, the female flower closes, and after twelve to eighteen hours, it opens once more, now a male. Some six hours later, the flower closes again, waits a half day, and reopens as a female. And

again, it closes, reopens as a male, closes—and, providing it has become pollinated meanwhile, proceeds to set fruit.

This rhythmic opening and closing suggests that the flowers cannot pollinate themselves. But Dr. Robert W. Hodgson, of the University of California, has discovered that while females usually mature in the morning, some male flowers are open at the same time. Unlike dates, for which fertilization must be undertaken by hand (P.S.M. Nov. '36, p. 22), avocados are fertilized by bees and other insects which carry pollen from flower to flower on their bodies and legs.

Trees blooming in March or April yield their fruit the following year. If the blossoms appear in April, the fruit ripens in July of the next year. Thus, most of the fruit hangs on the tree longer than a year, requiring almost two seasons to ripen. After picking, the fruit must soften at room temperature.

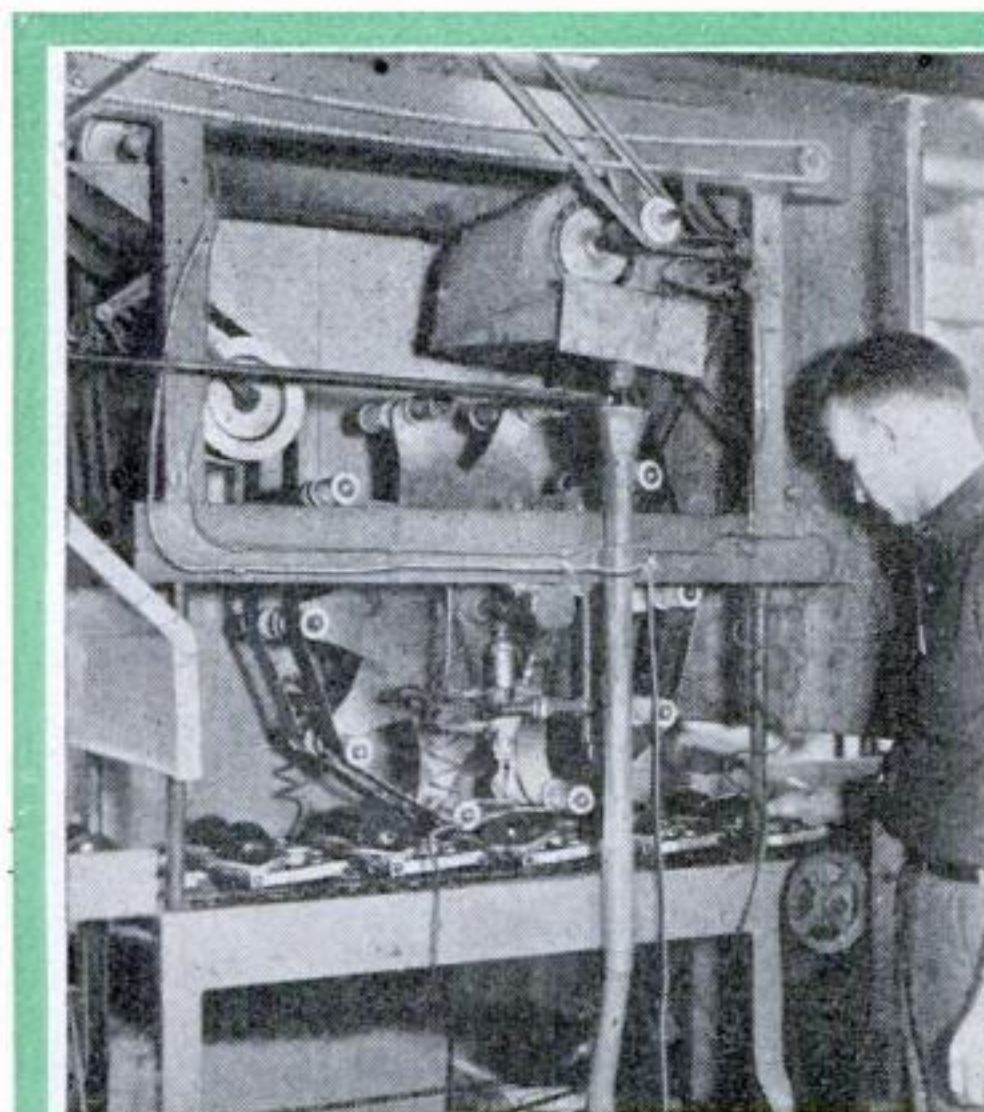
Avocados are most like olives in that they possess high oil content. They are akin to meat in containing protein. Yet they really are a "butter" fruit as to consistency, composition, and flavor.

Oddly, they bear abundantly in alternate years. This is particularly true of the Fuerte, the commonest of all the California varieties. Science today seeks the answer to this horticultural riddle.

"We know," Dr. Hodgson told me, as we examined the tiny seedlings, "that two and one half times as much energy is required to manufacture oil as carbohydrate. Also, plants must first manufacture carbohydrates, then convert them into oil. This may be related to irregular bearing, the new industry's biggest production problem."

For five years, Dr. Hodgson has sought the key to this mystery, with no positive results so far. The best science can do is to predict each year's crop on the basis of last year's production and the current weather. Favorable weather in an "on-crop" season, or one following a lean year, promises a bumper yield, while unfavorable weather in an "off-crop" season spells failure.

Meanwhile, he has found that gir-

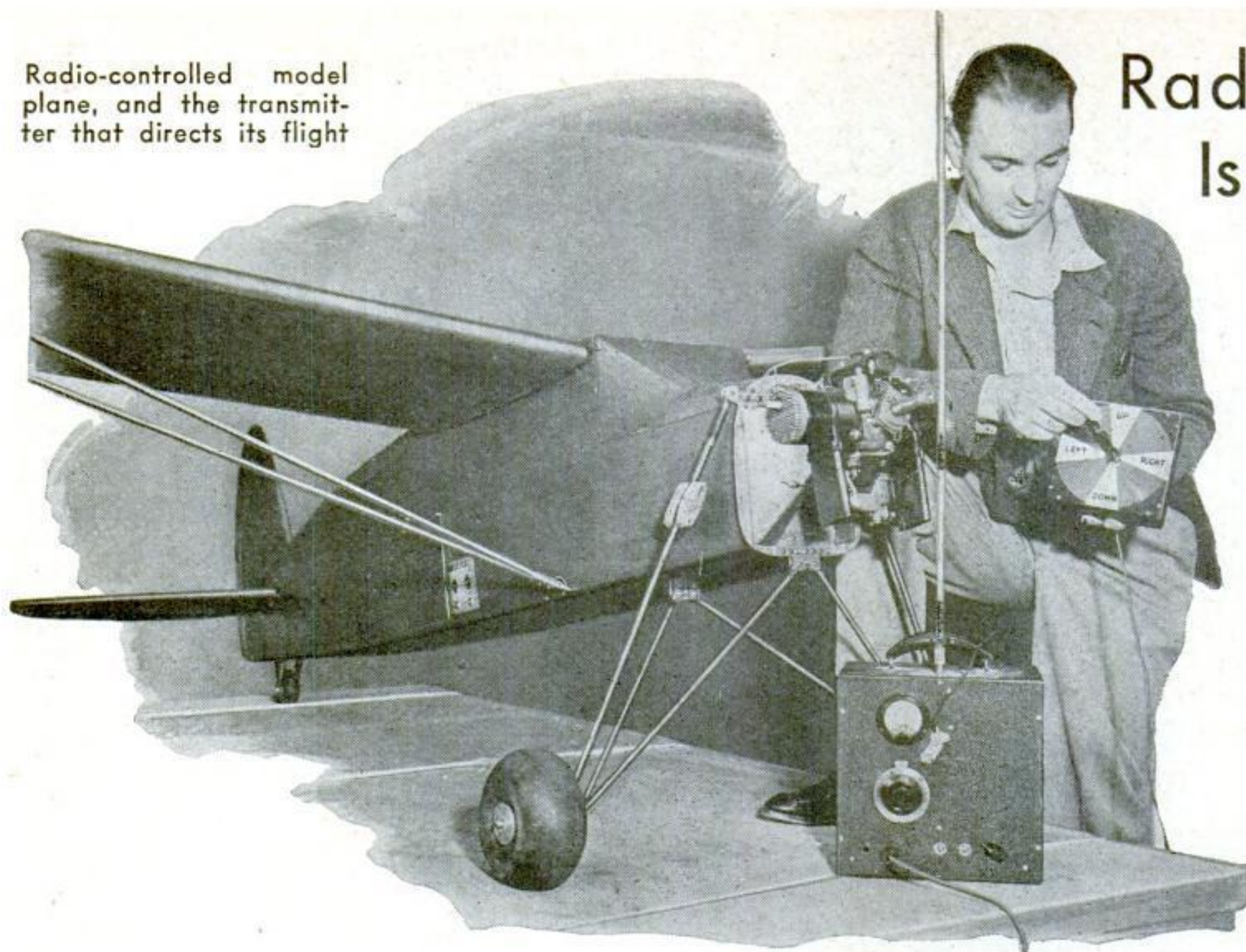


This machine stamps a brand name on each fruit. Right, avocados rolling off the conveyor into a bin, the floor of which lowers itself to keep the pile at the same level





Radio-controlled model plane, and the transmitter that directs its flight



## Radio-Directed Plane Is Gunners' Target

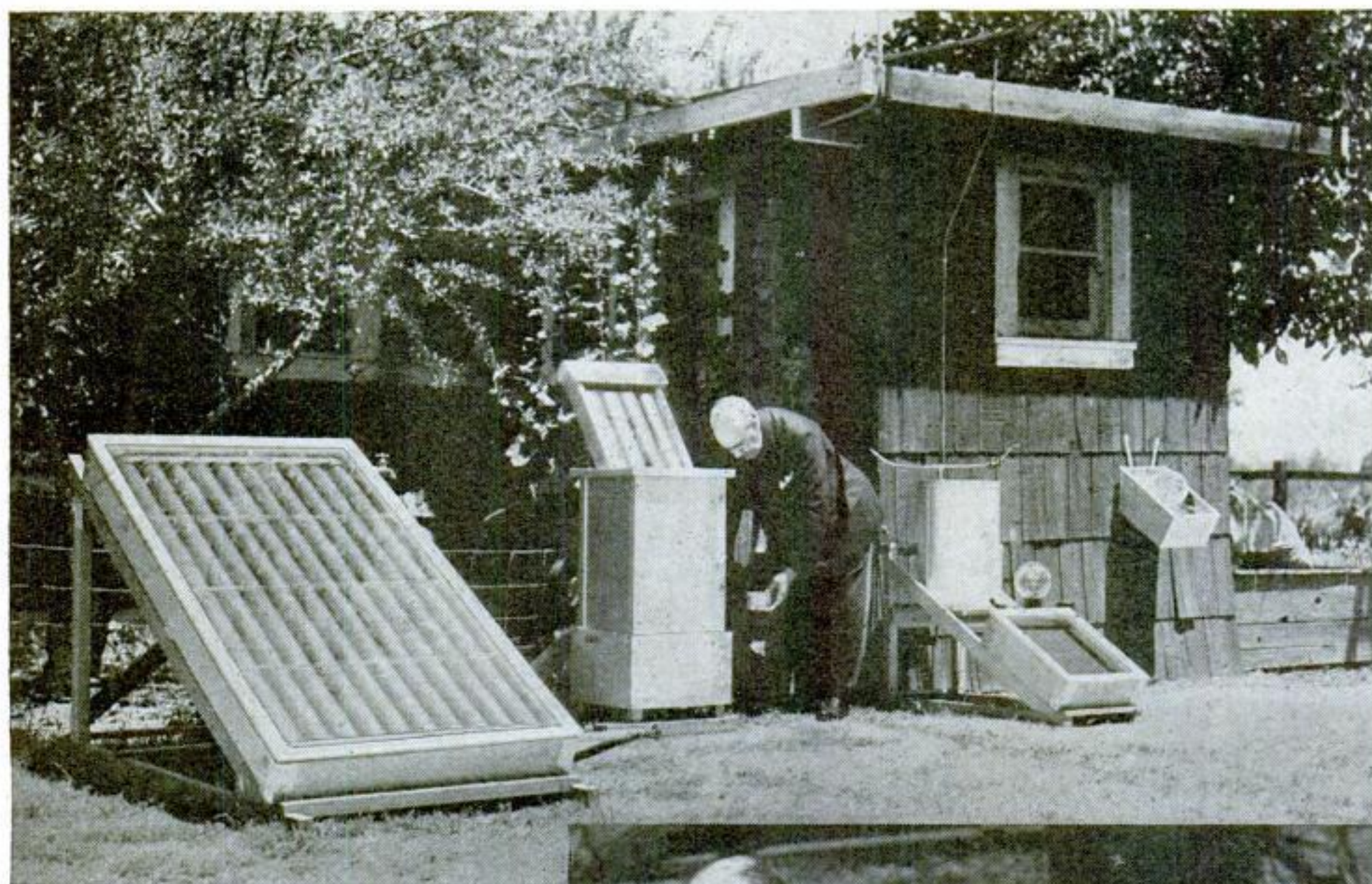
FLOWN under radio control, a gasoline-powered plane of twelve-foot wing spread has just been completed by two California model makers to serve as an experimental target for artillerymen. If trials prove successful, similar planes may be used for antiaircraft training. While the pilotless craft is in the air, impulses from a ground transmitter operate its rudder and elevator controls, through a receiver installed in its miniature fuselage.

## Glove Ends Thumb-Sucking

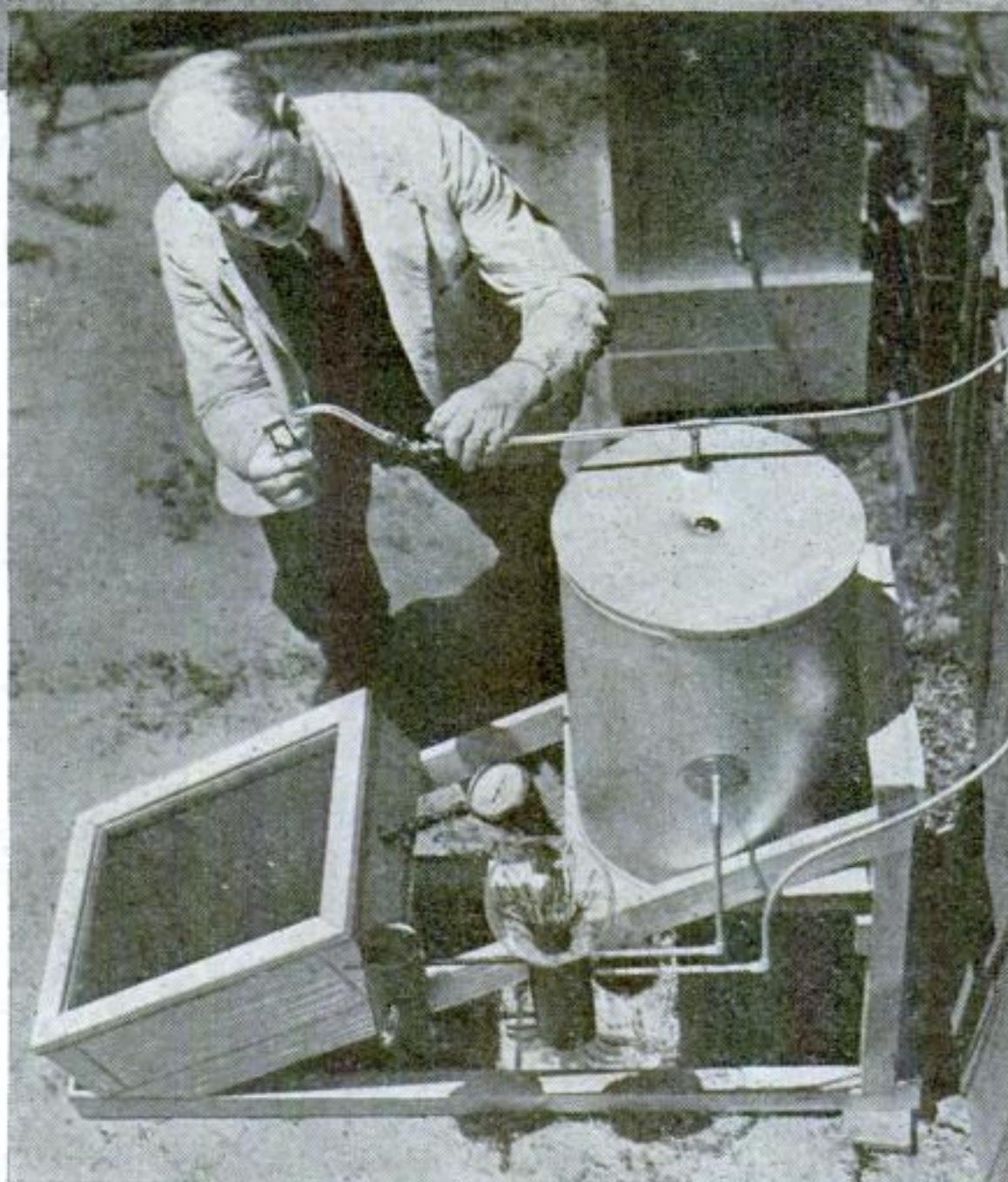


By adding imitation fingers of rubber to fingerless mittens, an inventor has produced gloves that not only prevent a baby from sucking his thumb, but also provide an agreeable substitute. The flexible tips are declared to satisfy the child without any harmful effects.

## Sun's Heat Used To Generate Gas for Fuel



**N**O WORRIES about gas bills trouble Otto H. Mohr, of Concord, Calif.—for he harnesses sunshine to provide himself with a free supply of gas for his kitchen stove. Applying a principle hitherto tried only on a laboratory scale, he concentrates the sun's rays upon a "thermoelectric generator" that converts their heat into electricity. Then he uses the electric current to decompose acidified water into oxygen and combustible hydrogen gas. The supply of gas is reported sufficient not only for cooking but also for house-heating purposes. In previous experiments (P.S.M., Oct. '35, p. 30), Mohr has employed solar boilers of his own design to furnish power for house-cooling systems.



Otto H. Mohr lighting a jet to test sun-made gas. Above, the fuel generator and frames that concentrate solar heat

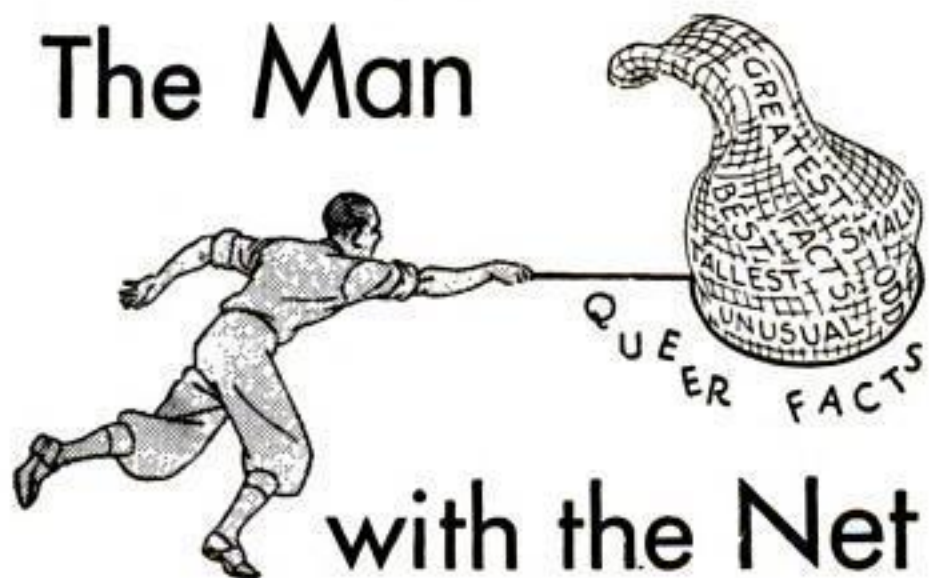


## Skate Wheels on Sled Give Summer Coasting

ROLLER SKATES that can be taken apart, devised by a Maspeth, N. Y., inventor, permit the use of their wheels to transform an ordinary sled into a vehicle for summer coasting on the pavements, as shown above. After being set in place, each pair of wheels is firmly clamped to the runner of the sled by a few turns of a standard skate key. At any time, the roller skates may be reassembled and used in the customary way.



## The Man



## with the Net

POTATOES belong to the same family as the deadly nightshade.

ALFALFA salad was served not long ago at a banquet in El Paso, Tex.



ALUMINUM-COLORED typewriter ribbons are now made for use with dark shades of paper.

BETTER seven inches long—two thirds the length of this column—grow in the West Indies.

COFFEE cools your toes. Delicate instruments show the skin temperature drops temporarily after the beverage is drunk.



RATTLESNAKES possess delicate "heat detectors" on their heads which enable them to determine their nearness to warm-blooded prey.

TEN INCHES of snowfall equals approximately one inch of rain.

WEAKEST SOUNDS in the English language are "S" and "F".

EACH human body, it is estimated, contains a microbe population equal to 1,000,000,000 times the whole human population of the earth.

GOSH, OVER A BILLION!



THINKING CELLS of the human brain are placed near the outside; in the brains of the lower animals they are located on the inside.

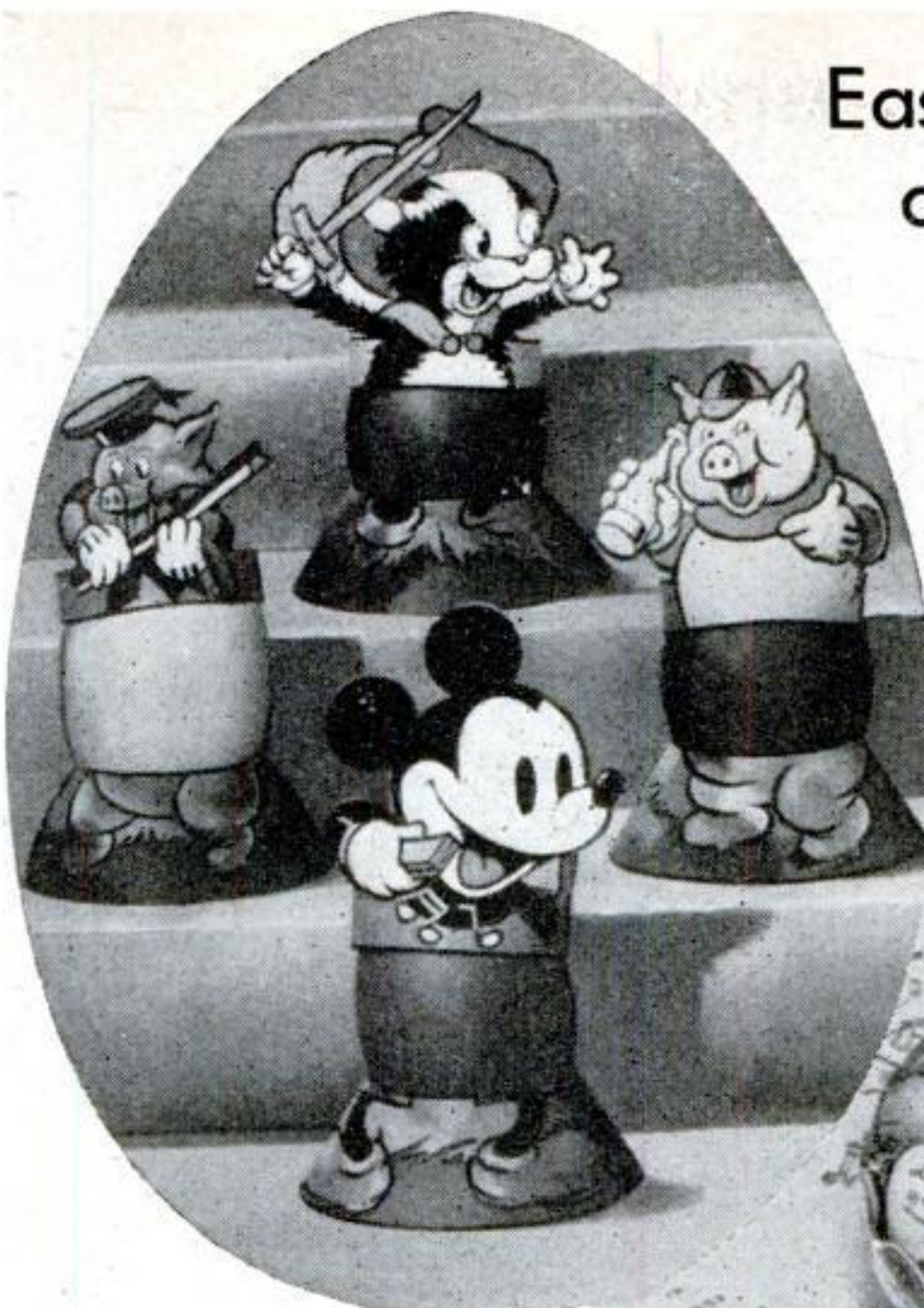
"FISH WOOL," a textile material being made in Germany from cellulose and fish albumen, is said to be as warm as sheep's wool.

ANTEATERS don't eat ants as a rule—they eat termites.



## Easter Eggs Masquerade as Cartoon Characters

EASTER EGGS may be transformed into likenesses of cartoon and nursery-tale characters, with attractively colored cut-outs now available in book form. Each design provides both a base and a headpiece for a tinted egg, as shown, and the book contains materials for dressing up twenty eggs in different guises.



Cut-out bases and headpieces transform these Easter eggs into familiar nursery characters. At the right, the figures are seen as party favors.



## "Gun" Sprays Powder To Reveal Fingerprints

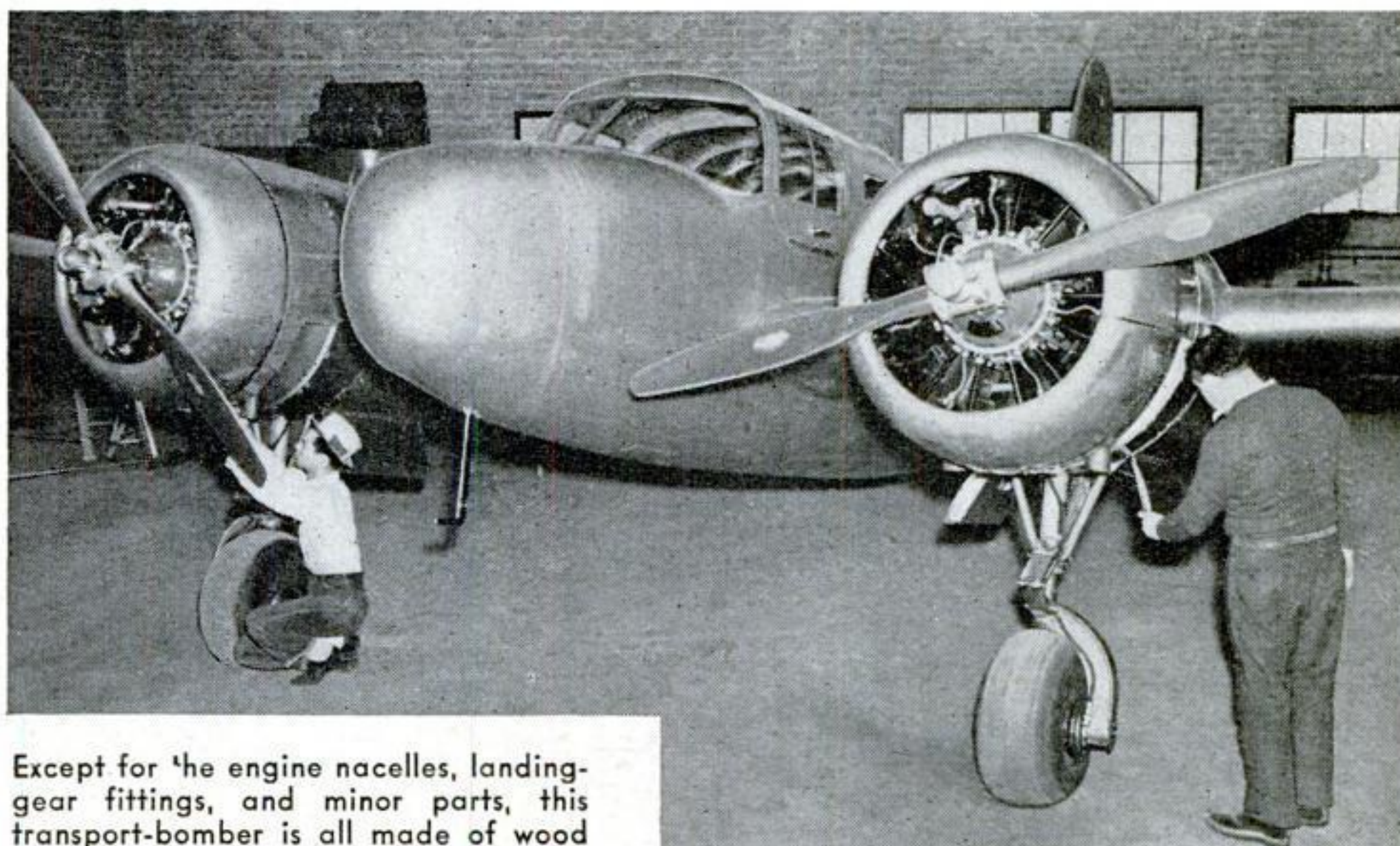
SPRAYING powder instead of bullets, a novel "gun" has been devised to trap criminals by making latent fingerprints visible. Interchangeable chambers permit any desired powder to be fed into the implement. A blower operating on house or battery current directs the powder upon the surface to be searched.



Electric blower dusting latent fingerprints

## Big Transport Plane Is Built of Wood

BUILT almost entirely of wood, a convertible transport-bombing plane just completed in California represents a radical departure from modern all-metal design. The new type is declared to be capable of better than 200-mile-an-hour speed.

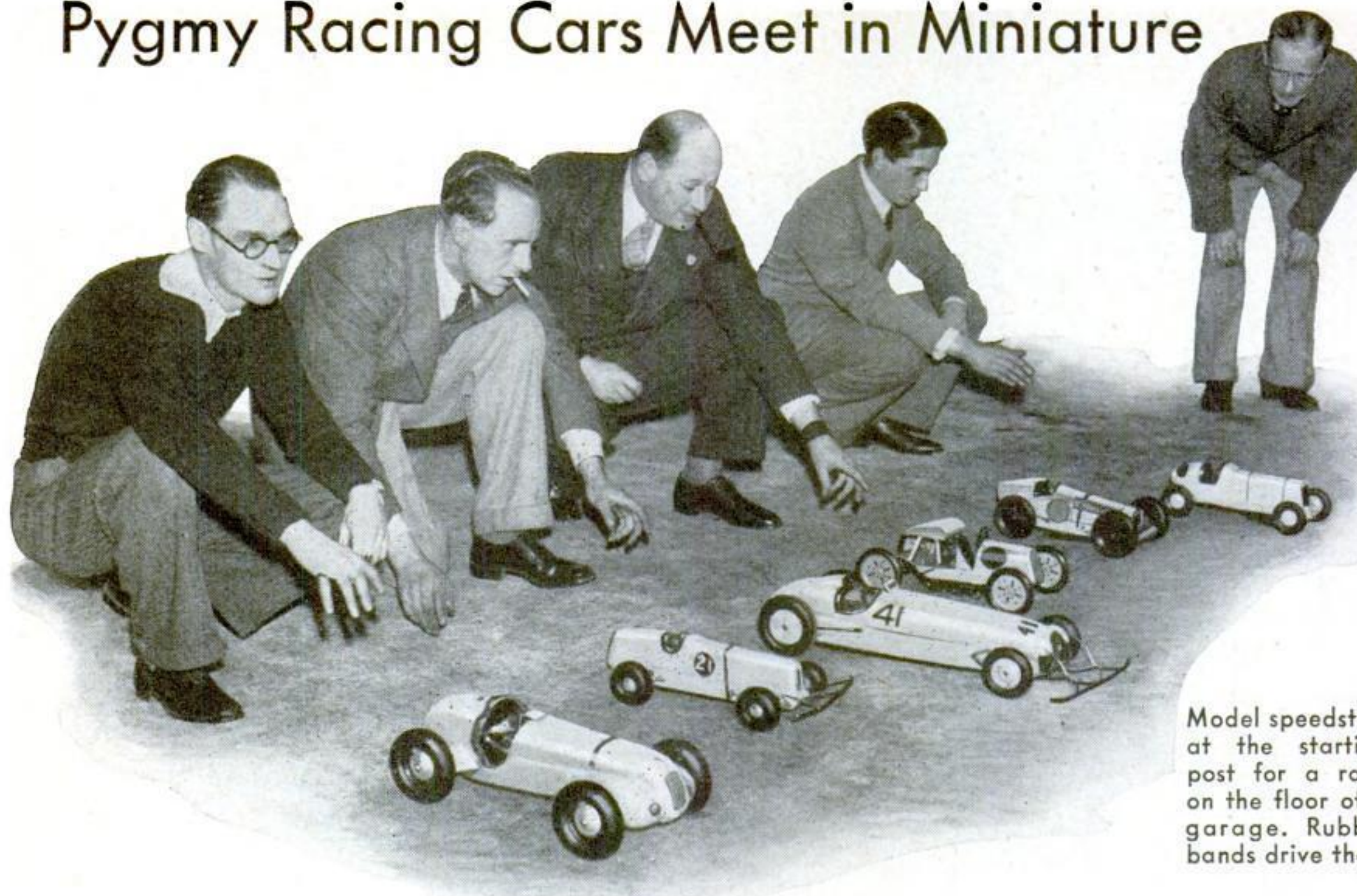


Except for the engine nacelles, landing-gear fittings, and minor parts, this transport-bomber is all made of wood



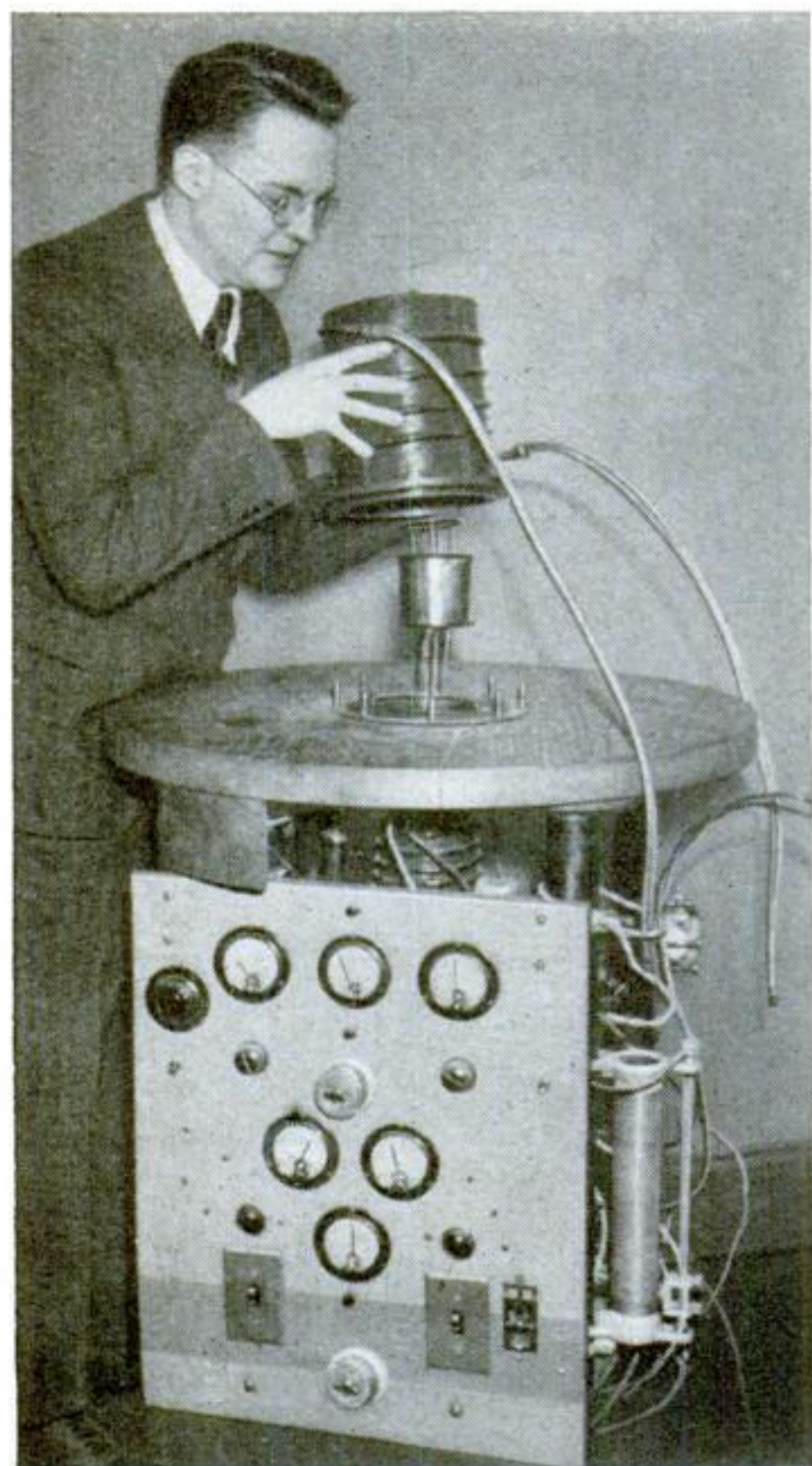
## Pygmy Racing Cars Meet in Miniature

## Sweepstakes



Model speedsters at the starting post for a race on the floor of a garage. Rubber bands drive them

MIDGET automobiles vie in thrilling races staged by British model-making fans, who are shown in the illustration at the start of one of the contests held in a London garage. The models range in length from six inches to two feet, and are driven by strands of rubber elastic. Speeds up to forty miles an hour are reported to have been attained. Some of the model builders have provided their cars with spring bumpers to protect the speeding racers from damage if they should collide with others or with a wall. So popular is the new sport that a model-car racing association has been organized to hold meets for enthusiasts.

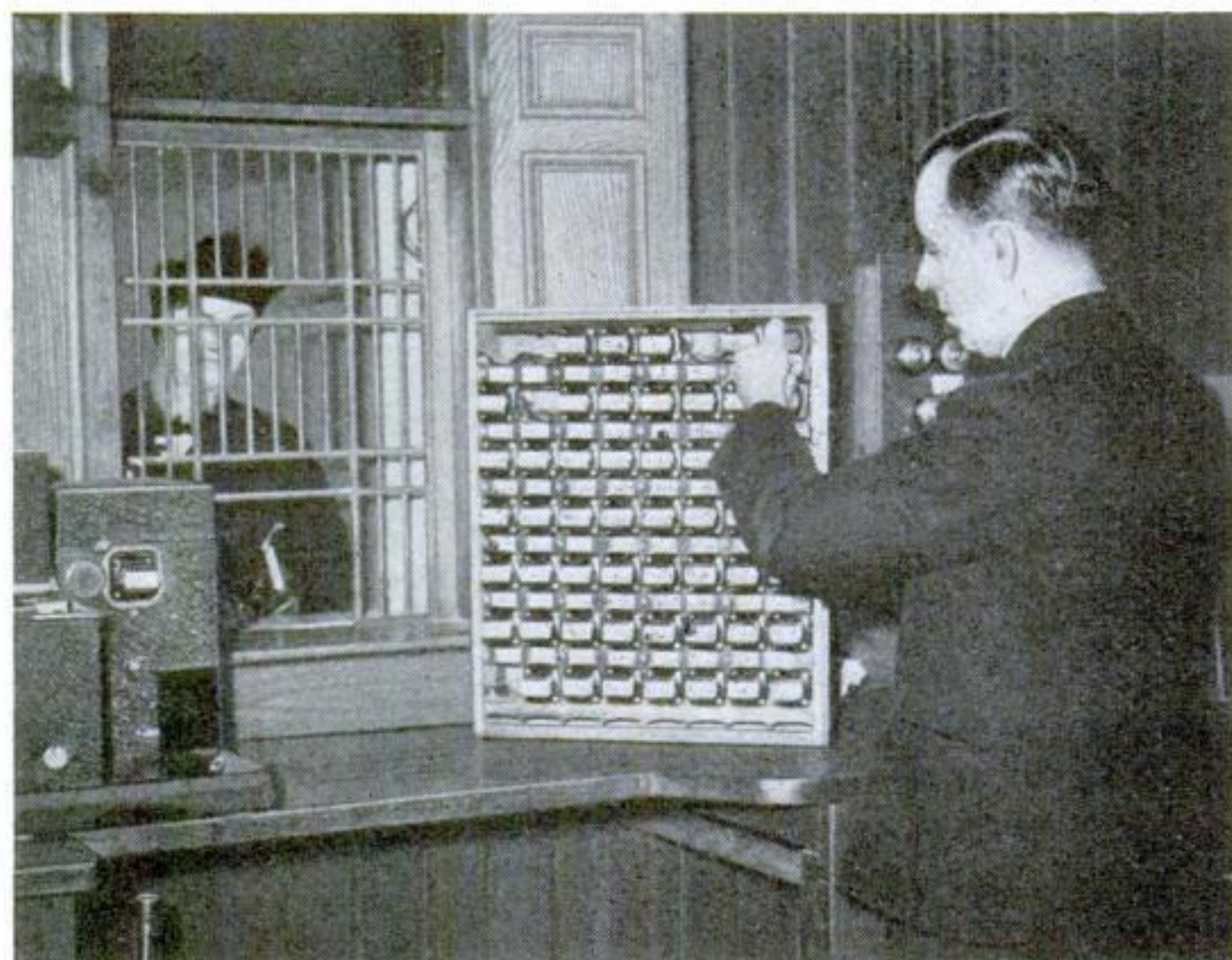


### Odd Electron Furnace Melts Stubborn Metals

APPLYING a new principle to attain temperatures up to 4,500 degrees F., an "electron furnace" devised by Dr. Ralph H. Hultgren of Harvard University easily liquefies hard-to-melt metals such as platinum, iridium, and palladium. Closed with an air-tight cover as shown above, it maintains an almost perfect vacuum while speeding electrons from a pair of electric filaments bombard a crucible positively charged to 2,500 volts. The energy of their impacts is transformed into heat.

## Individual Train Tickets Printed to Order

ALL the various tickets used by subway riders of London, England, according to their destinations, will soon be printed to order by ingenious machines installed in the underground booths. Formerly prospective passengers could be supplied with tickets at a rate of only eight a minute, while twelve tickets a minute can be sold by a clerk using the machine method.



Using this new machine, a clerk can sell twelve tickets a minute

## Dummy Gas Tank Shows Short-Measure Sales



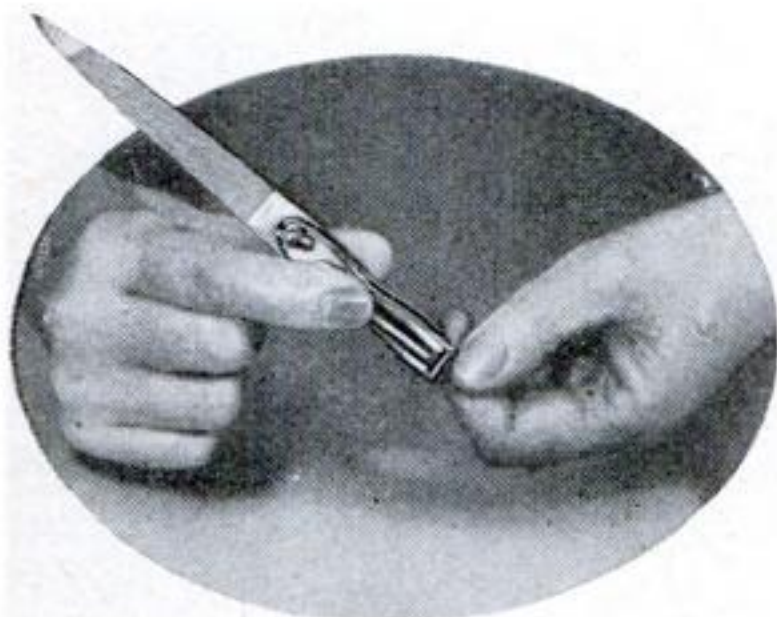
False tank removed from car for measuring gasoline pumped into it

STOPPING at a gas station, an inspector of New York City's Department of Markets may have several gallons put into a dummy tank on his car. Detaching it, he promptly empties it into an accurate measuring can to make sure that full measure is being given. When the inspector really wants gas for his car, a secret tank is filled through the spare-wheel hub.

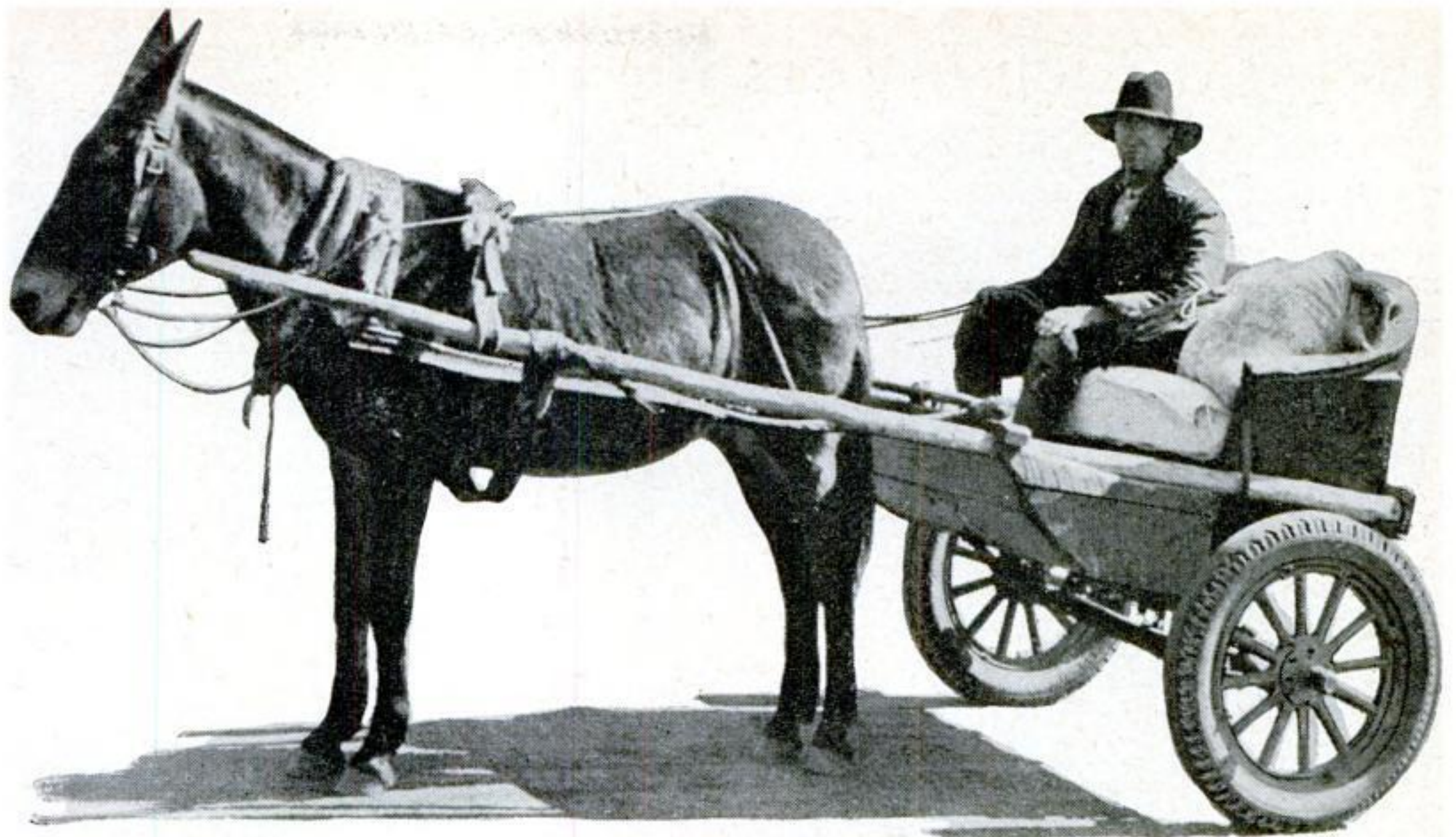


## Nail Clip and File Are Combined

NAIL CLIP and straight file are combined in one convenient vest-pocket unit that is now available. The clipper, attached to one end of the file and forming the handle, is used to give the finger nail the general outline desired and the file to smooth out any rough edges. The accessory is pictured in use in the photograph below.



One end of the tool clips the nails, and the other smooths rough edges



## "Sand Buggy" Uses Old Automobile Parts

FRONT seat, axle, and wheels of an abandoned automobile were made into the novel vehicle shown in the photograph above. The two-wheeled cart is said to be particularly efficient for carrying heavy loads over the sandy woods

trails of western Florida, since the tires prevent the wheels from sinking into the loose sand. An automobile maker is said to be considering the manufacture of a four-wheeled "sand buggy."

Right, news photographer developing and enlarging pictures "on the spot" with the handy portable darkroom outfit below



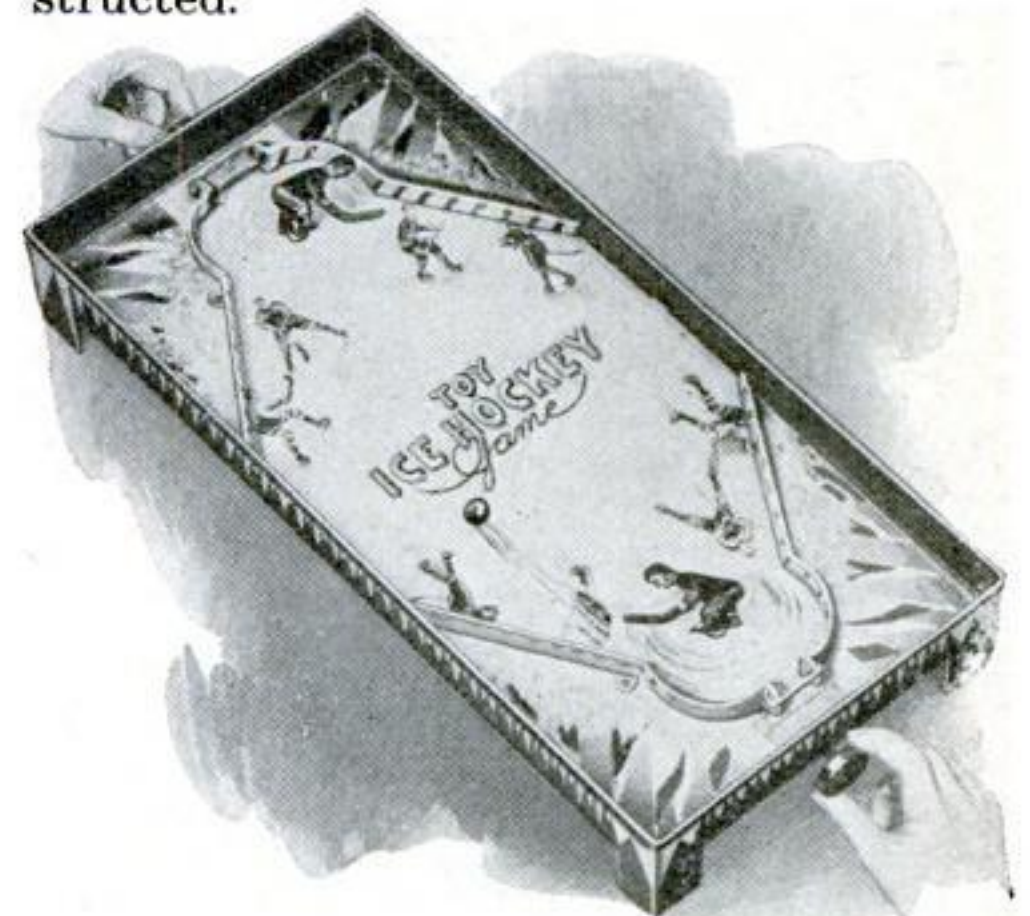
## Portable Darkroom Develops and Enlarges Photographs

PHOTOGRAPHS can be developed and enlarged right after they are made, with a portable darkroom invented by Ennis C. Helm, Oklahoma City, Okla., news photographer. Weighing only twenty-five pounds, the unit is not much larger than a suitcase. Stainless-steel developing tanks within the leather-covered

case are surrounded by water jackets for keeping the developing solutions at the desired temperature. Current for the printing and enlarging lamp may be drawn either from an automobile battery or from a standard 110-volt circuit. Enlargements up to five by seven inches can be made in the portable unit.

## Toy Goalies Swat Puck in Ice-Hockey Game

PLAYED on a board representing a rink, a novel ice-hockey game provides many of the thrills of the actual sport. Knobs at the ends of the board operate steel manikins which swing around to strike a ball with their sticks as each player tries to drive it into his opponent's goal. The steel playing board is sturdily constructed.



Each player tries to make his toy "goalie" knock the ball past his opponent's guard

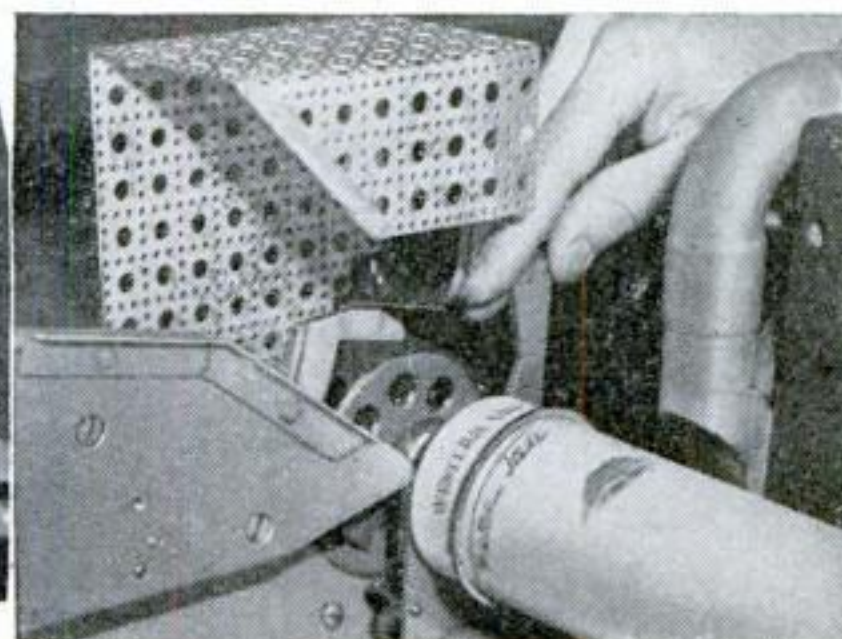
## Now You Can Chew a Cup of Coffee

CUPS of coffee in chewing-gum form are a new confection now on the market. Real coffee essence is used to flavor the gum, so that it tastes like black coffee and is said to produce the same stimulating effect as a cup of the beverage taken in the usual liquid form.

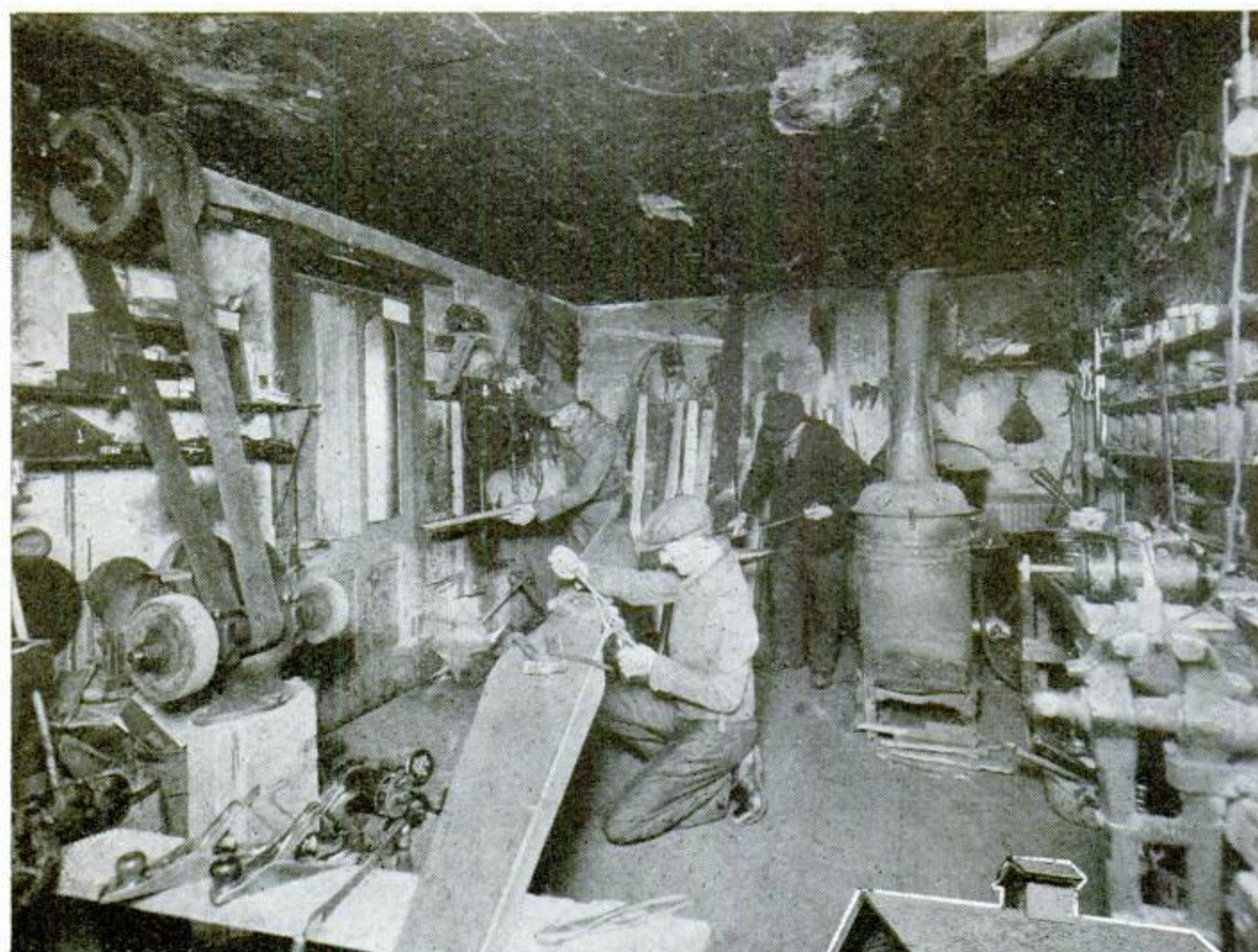


## Telegraph Kisses Are New Fad

SENDING kisses by wire is a new use for facsimile telegraph transmission. Recently a New York girl kissed a telegram blank and the lipstick impression was placed on the facsimile transmitter, as at left, to be reproduced for delivery in Chicago.







The Albers brothers at work with their father in the home workshop of their farm in Iowa

**T**HREE YEARS AGO, one of America's largest makers of radio sets got what seemed to be a brand-new idea. He thought it might be possible to use some sort of windmill generator to provide electricity for operating radio receivers on farms remote from power lines. He put an engineer to checking the scheme, with instructions to visit all makers of farm windmills to see what he could find.

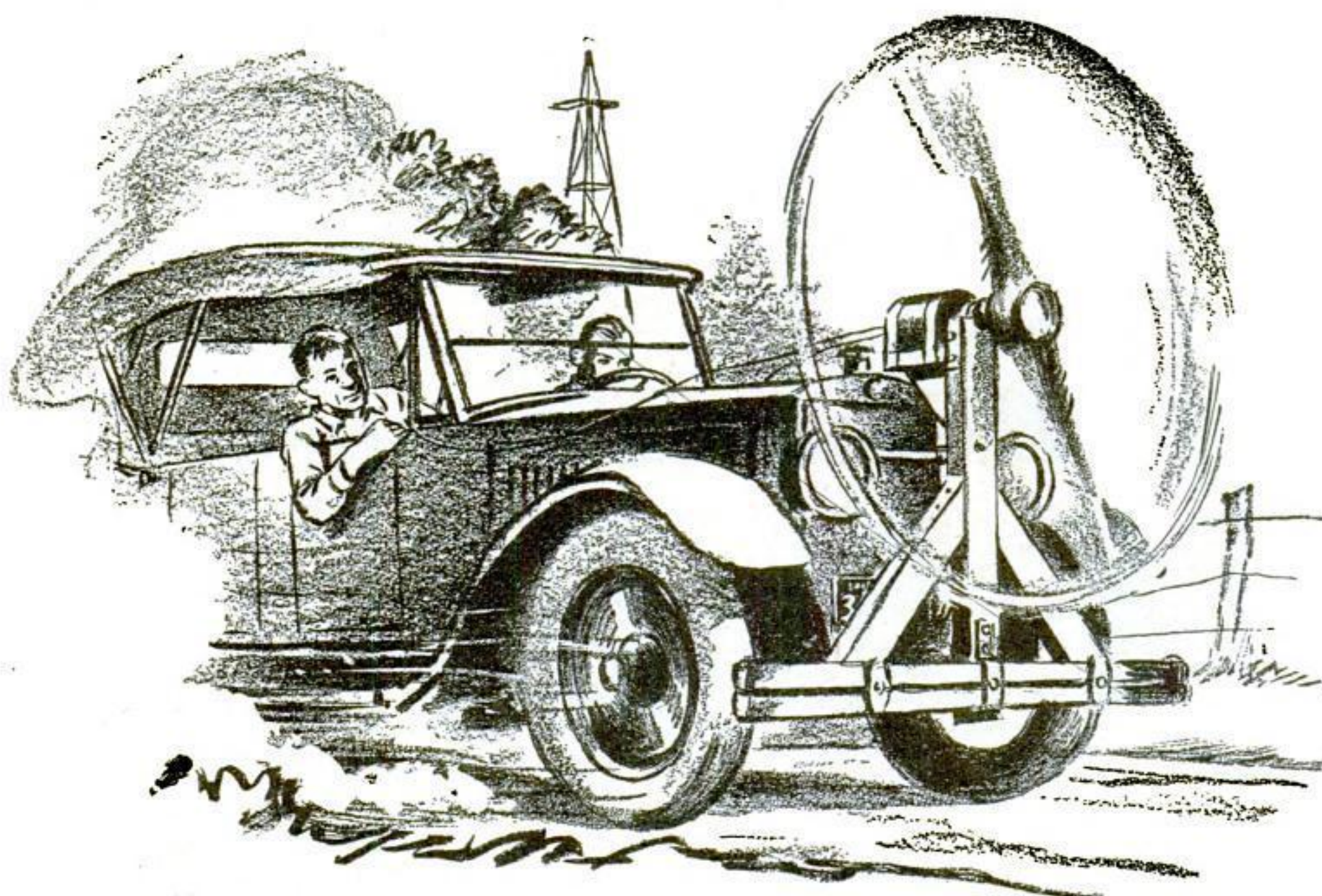
Next morning the engineer was back, his eyebrows still arched in astonishment at what he had learned. "From all I hear, this idea has been worked out already by somebody in Iowa," he told the boss. "I'm going to Sioux City to have a look."

Two mornings later he returned, more

amazed than before. "You'd better go to Sioux City," he insisted with suppressed excitement. "There's a couple of farm boys out there who have this problem licked."

What the boss found when he went to Sioux City was a pair of brothers, John and Gerhard Albers. They were young fellows, obviously country-bred. And, in an astonishingly short while, they had become leaders of an industry which they themselves had created.

By **ARTHUR VAN VLISSINGEN**



To test the efficiency of a propeller, they put it on the front of the family automobile

# Riches

HOW TWO BOY



Soon the rural mail carrier was bringing about ten orders a day

On that day three years ago, the Albers boys were so busy making their windmill generating outfits that they did not have time to be impressed by a visit from a nationally known figure in industry. Nor were they especially eager to stop work-

ing long enough to talk business with him. When finally he got them interested, it took him several days to buy a half ownership in their company.

Their windmill charger originated some ten years ago, when Gerhard was in his middle twenties and John was about ready for his first vote. On the farm, the family had a battery-powered radio set. Once a month it was necessary to take the battery over to the near-by town of Cherokee, pay the garage a dollar to charge it, and miss a couple of days' broadcasts. The boys begrudged the interruption, and their father could not spare the dollar. It was this simple set of facts that started them on the road to success.

The Albers farm boasted few books, but the boys liked to read. Gerhard used to call on a town girl whose father had a sizable library. Among these books was Fridtjof Nansen's "Farthest North," the explorer's record of his exploit in freezing his ship, *Fram*, into the ice above Siberia in the autumn of 1893 and drifting across the polar regions. In this book was the story—even to photographs—of a windmill on the *Fram's* deck, used to generate electricity. While the millionaires of New York City and Chicago lighted their mansions with gas, kerosene, or candles, Nansen in his icebound ship in the polar sea had been reveling in electricity.

Reading Nansen's book, these farm boys saw in the idea of generating electrical current by windmill a solution for the farm-radio problem. Stored away in the farm workshop was an old windmill which had been retired several years earlier. On a neighbor's farm stood a twisted tower from which a



# from the Wind

## MECHANICS STARTED A BRAND-NEW INDUSTRY

storm had torn its mill. The neighbor would be glad to rid his land of the eyesore if the boys would take it away. They dismantled the tower, straightened the steelwork, and set it up again at the home farm with the discarded mill from their workshop. They got an automobile generator at a junk yard, and connected it to the windmill with gears from an old cream separator. The homemade contraption worked well enough to keep the radio battery charged, but it fell far short of suiting its builders.

Even then, they were good mechanics. Their father had always been the neighborhood handy man, not for money but rather for the fun of it. When he needed helpers, Barney Albers drafted Gerhard and John. Because he loved mechanical jobs and therefore loved tools, he had accumulated a respectable assortment of machinery in his farm workshop.

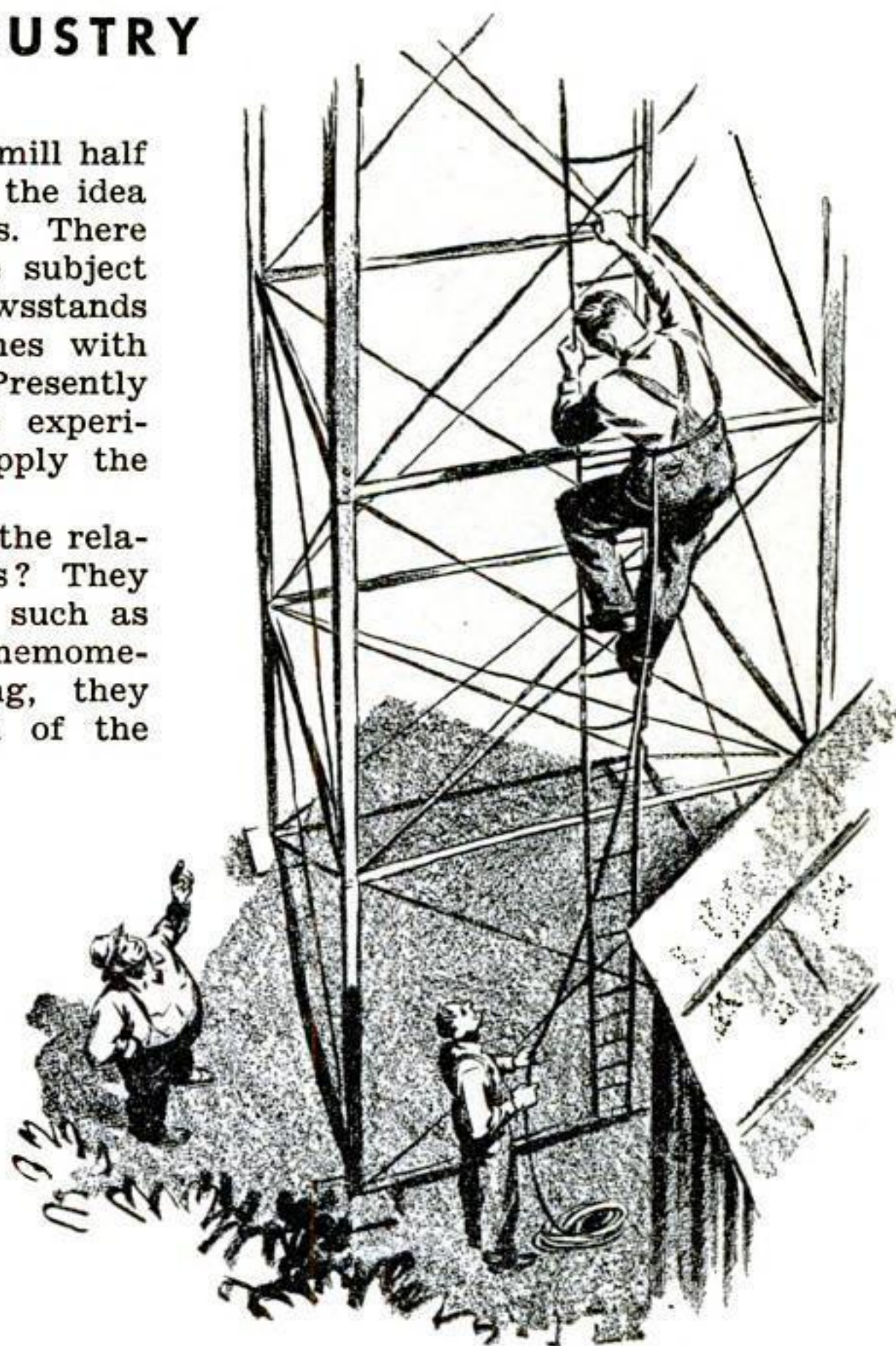
The first need that these mechanically-minded farm boys saw for improving their charger was in the wind wheel. Farm windmills are designed for driving water pumps, and it takes a good breeze to start one of them. What was wanted was a wheel that would turn rapidly even in a light wind.

So they rebuilt the old windmill half a dozen times. Then John got the idea of reading up on aerodynamics. There weren't any textbooks on the subject around Cherokee, but the newsstands had lots of airplane magazines with articles on propeller design. Presently the boys were whittling out experimental propeller blades to apply the principles they had learned.

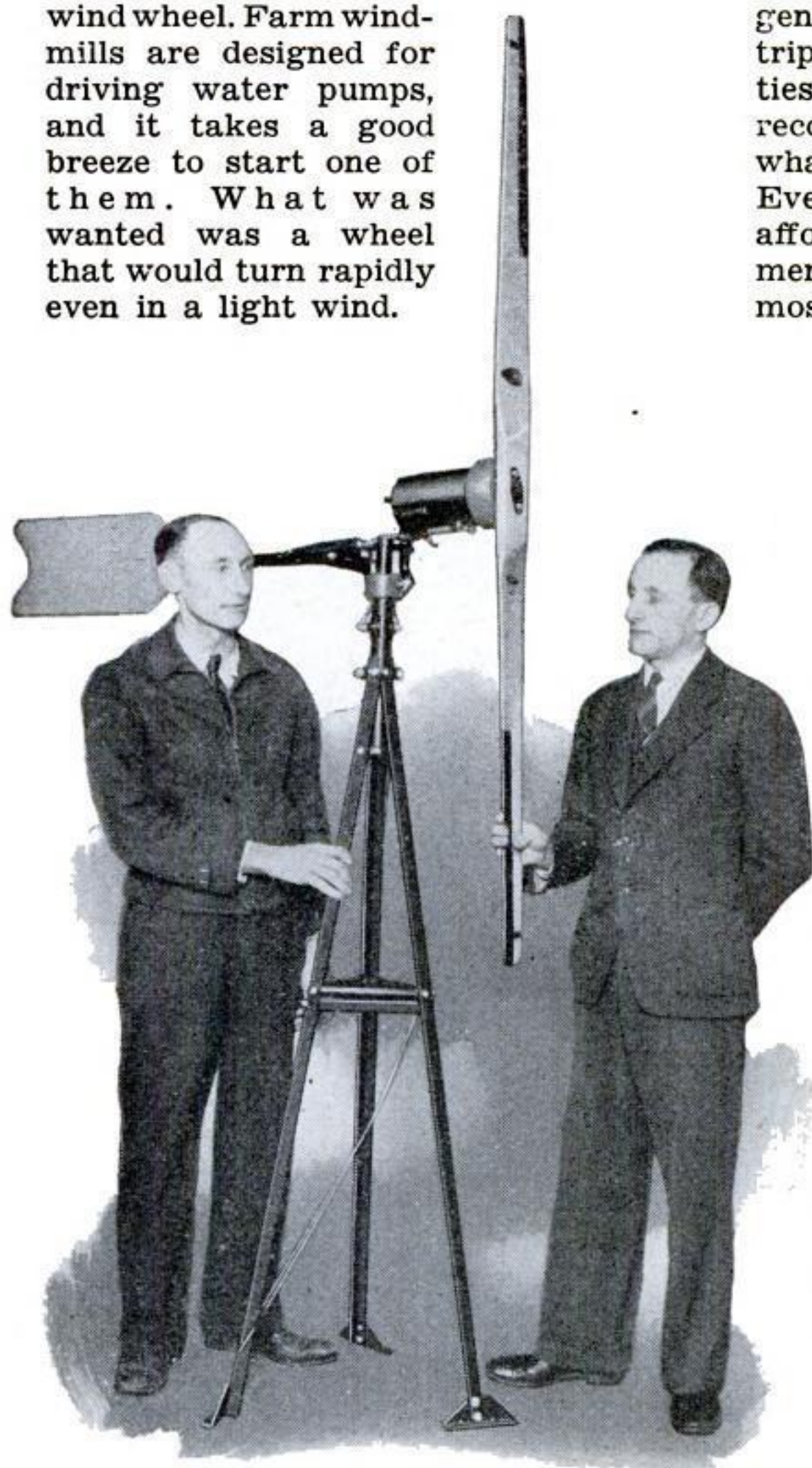
But how were they to know the relative efficiencies of these blades? They had no laboratory equipment such as wind tunnels, blowers, and anemometers. After a little thinking, they mounted the propeller ahead of the family automobile, hooked it to a junk-yard generator, and wired on an automobile ammeter. Then, to find the efficiency of a given propeller in, say a ten-mile wind, they drove up the road ten miles an hour, and drove back at the same speed. One brother steered the car while the other watched the instrument and recorded the electricity generated. The two-direction trip ironed out any inequalities due to wind, so that the recorded average showed just what the propeller would do. Even today, when they can afford any conceivable scientific equipment, and when they retain the foremost university laboratories as consultants in their work, they still sometimes resort to the old automobile road test.

Eventually, the Albers brothers developed a successful propeller which their magazine reading told them was definitely of airfoil type.

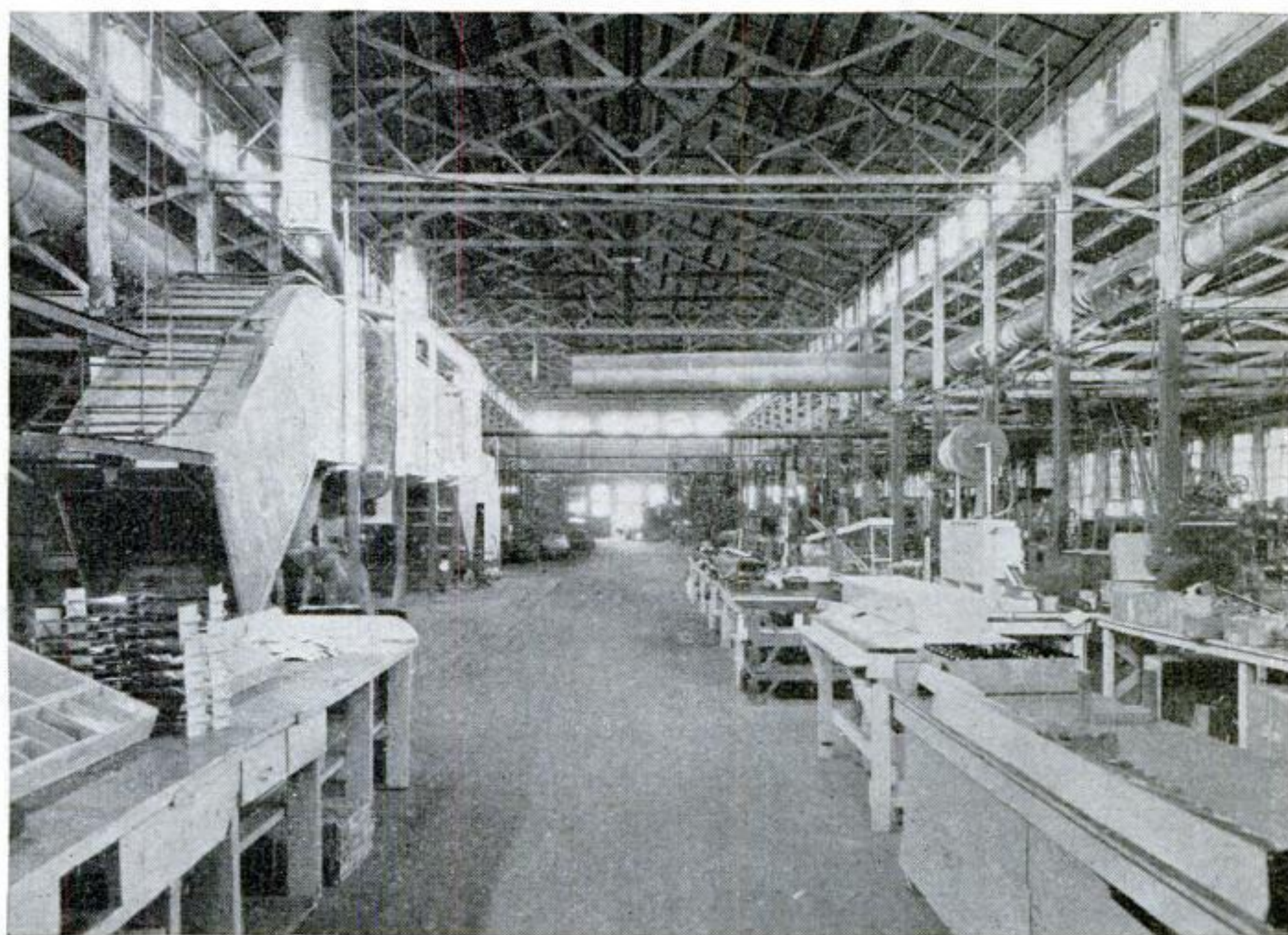
That is, the propeller turns not from the drive of the wind against its face, but from the pull of the partial vacuum against the back of the blade. They refined the design, literally by cut-and-try, until they had something so efficient that the wing tips of their present six-foot propeller travel thirteen times as fast as the wind that is making it turn around. *(Continued on page 116)*



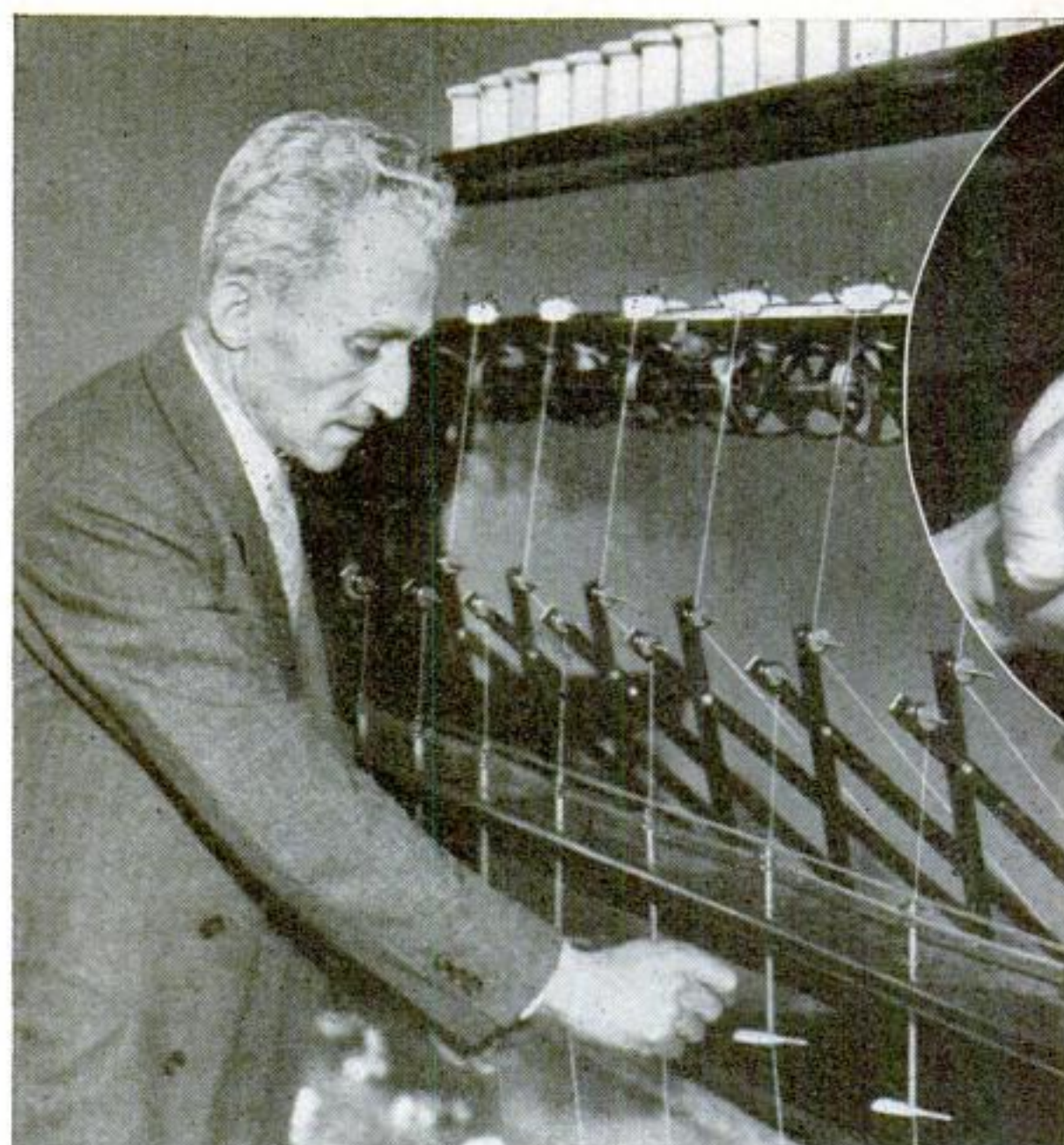
They dismantled the tower and set it up again on the farm



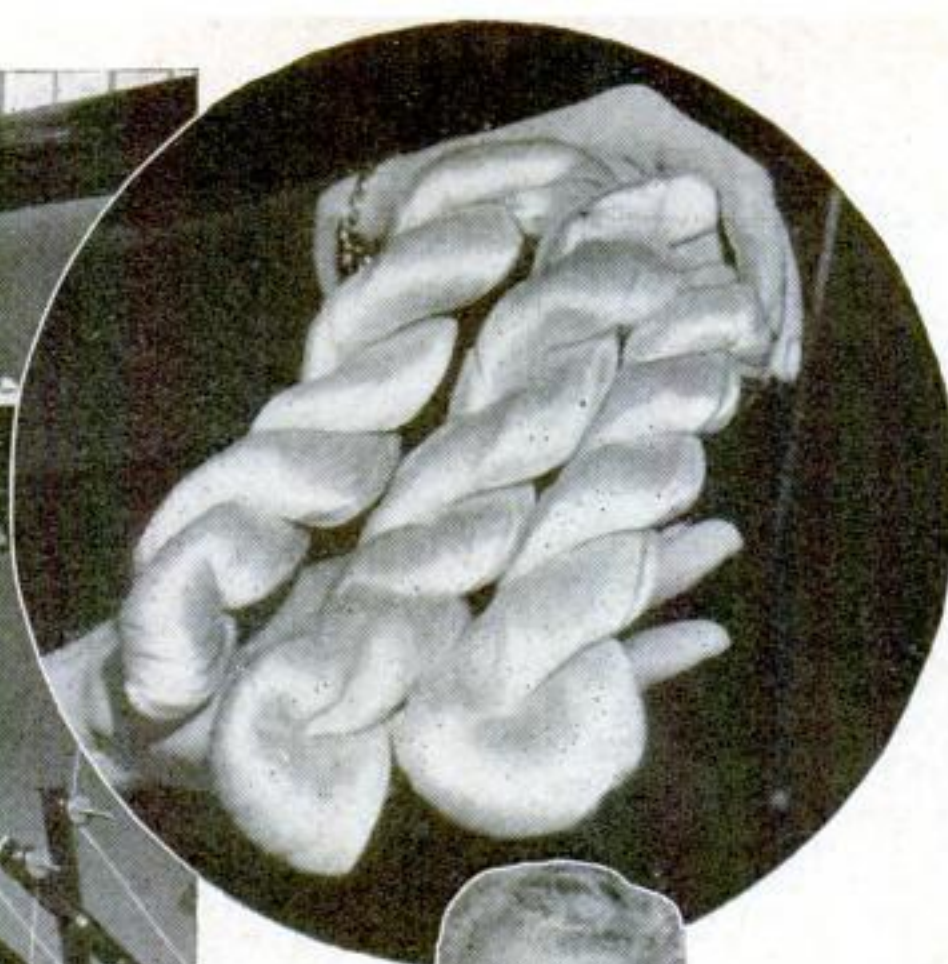
John and Gerhard Albers with one of their outfits for generating electricity from the wind. At right, their factory at Sioux City, Iowa







John Ousta operating his simplified silk reeler in the parlor of his home. Right, skeins of raw silk



## Wool Glued to Canvas Makes Novel Pictures



PAINTING pictures with wool is the novel occupation of Maria Pfeifer, a German artisan. On canvas stretched across a wooden framework, the artist pastes bits of wool thread of various colors to build up a realistic scene. The photograph above shows the wool-painter at work in her studio, with threads of different hues piled on a work table.

## American Silkworm Raiser Invents Reeling Machine

FOLLOWING several successful years of raising silkworms in the attic of his home (P.S.M., Aug. '36, p. 25), John Ousta, of New York City, has invented a simplified machine to reel silk from cocoons into skeins, a process heretofore requiring complicated machinery. Employing secondhand automobile parts for some of its mechanisms, the reeler shown in operation above is set up in the parlor of Ousta's home. All steps in silk production, the inventor believes, can now be carried on in this country.



Cocoons made by silkworms in New York City



## "Twins" in School Are Not Related

Two students in Rochester, N.Y., were born on the same day, have the same family name, and are identical in height, weight, complexion, and hair color, but are not twins and not even related. As a further coincidence, the unrelated "twins" both applied for admission to the same school on the same day to study commercial photography.

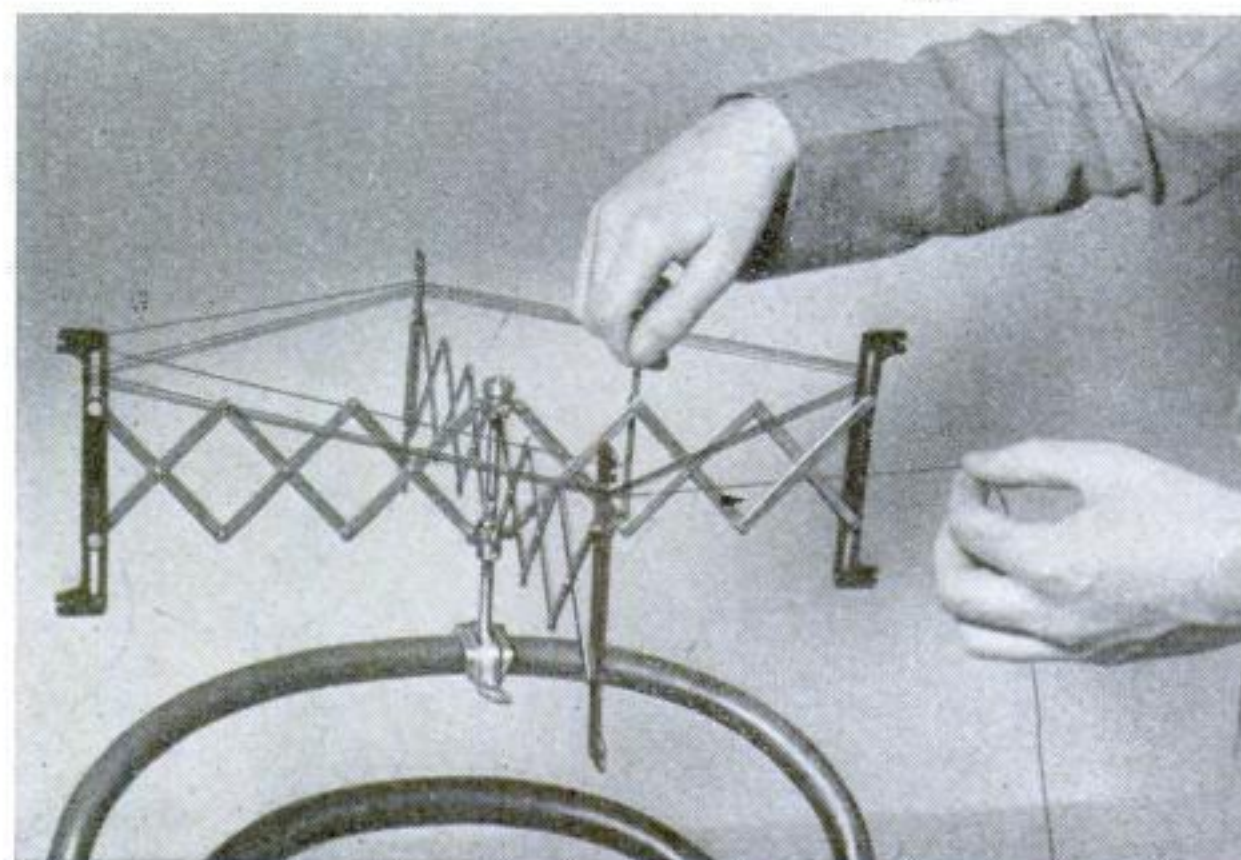


Frank and Donald Ross studying photography

## Solitaire Bridge Game Uses Automatic Board

ONE person can play four-handed bridge with a new automatic game board. As the player manipulates levers to bid and play his hand, the actions of his partner and opponents are automatically performed by the board. "Solitaire" bridge boards are shown above being used in a beauty parlor.

CLAMPED easily to any convenient support, a collapsible fishline drier just introduced is a handy accessory for anglers. Over a yard and a half of wet line can be wound at each turn around uprights mounted at the ends of two extension spreaders, as shown in the photograph at the right. All metal parts of the unit are treated to render it rust-proof. When not in use, the drier folds into a compact space.



This handy drying reel collapses into small space for carrying

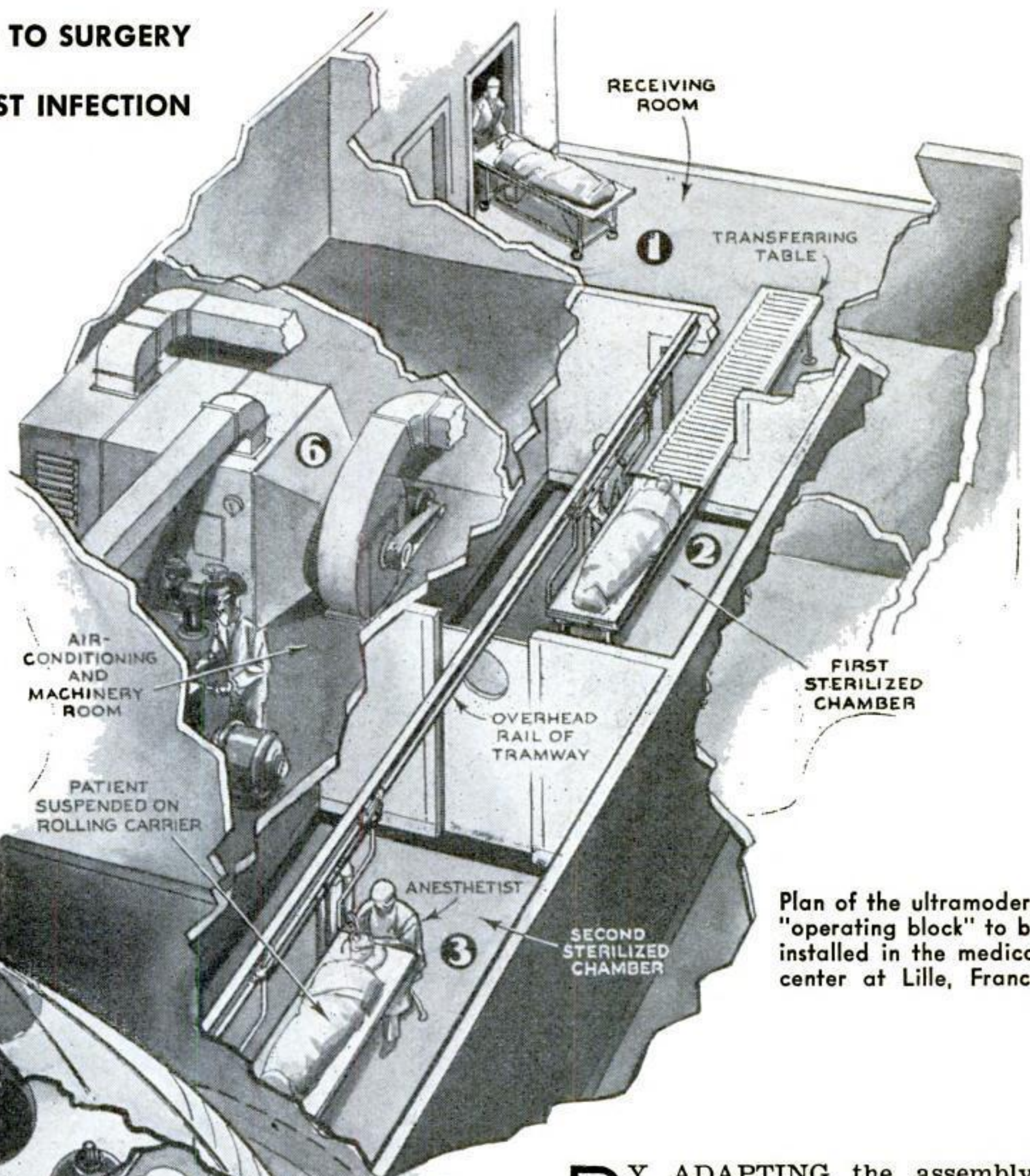


# Germproof Operating Room

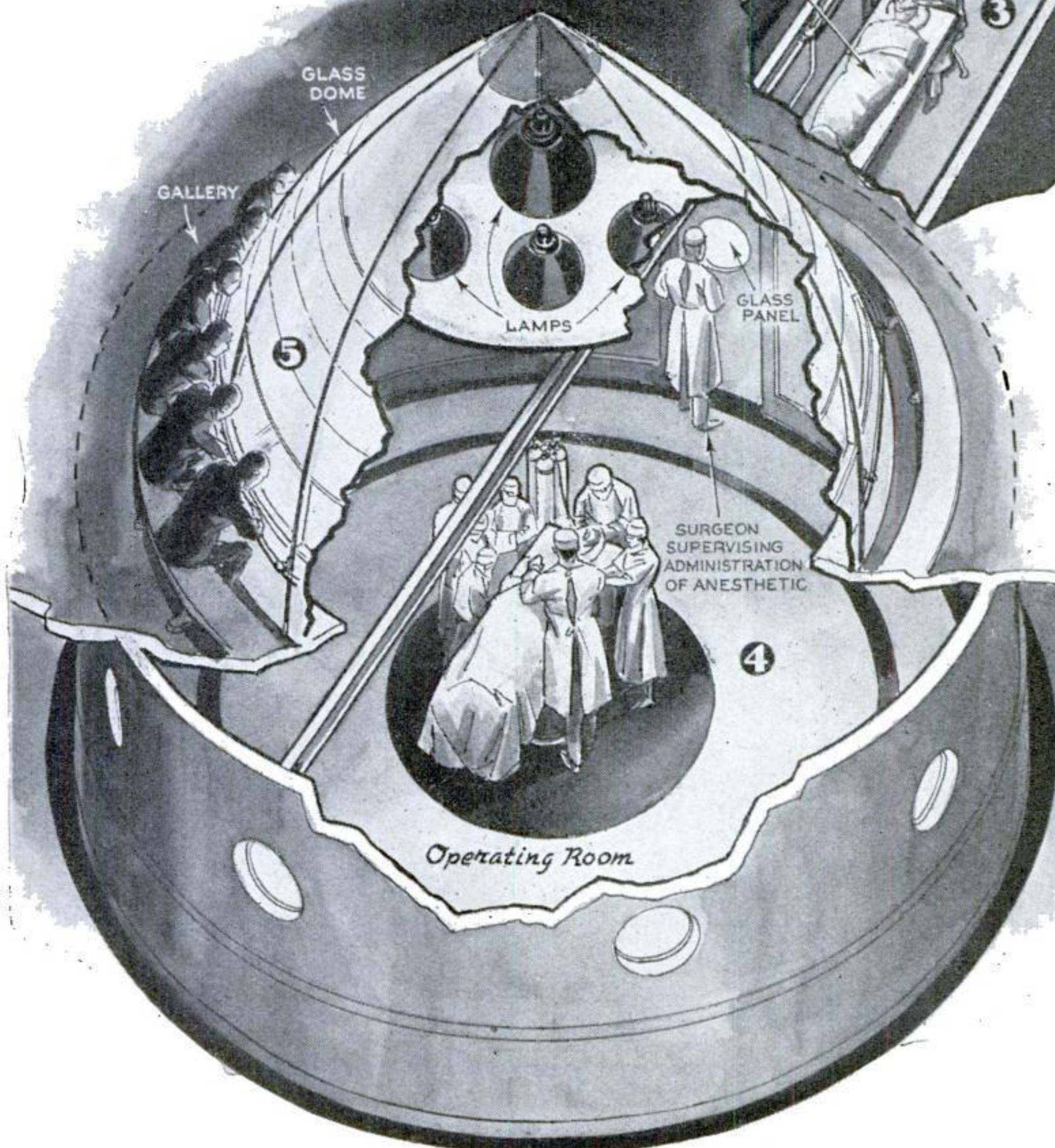
ASSEMBLY-LINE METHODS APPLIED TO SURGERY

HELP TO GUARD PATIENTS AGAINST INFECTION

- 1 Patient arrives in receiving room, which is not sterilized.
- 2 Transferred to overhead tramway, patient is prepared for operation in first sterilized chamber.
- 3 Still on tramway, patient receives anesthetic in second sterilized chamber.
- 4 Arriving in operating room, patient is lowered from tramway to operating table, and operation is performed in absolutely sterile surroundings.
- 5 Medical students watch operation through glass dome that excludes them from contact with air in operating room.
- 6 Conditioning and sterilizing apparatus supplies germfree air to operating room and outer chambers, maintaining slightly more than atmospheric pressure to keep outside air from leaking in.



Plan of the ultramodern "operating block" to be installed in the medical center at Lille, France



**B**Y ADAPTING the assembly-line methods of a factory, an ultramodern "operating block" designed by a leading French professor of medicine will provide hospital patients with surgical treatment in surroundings as nearly germ-free as human ingenuity can devise. An overhead tramway built into the new structural unit conveys the patient through a series of interconnecting rooms where he successively undergoes initial preparations, receives the anesthetic, and finally arrives at the operating table. From the moment he enters the first of the outer chambers, which resemble the air locks of a gas-raid shelter, he is exposed only to sterilized and conditioned air admitted through special ducts. Air pressure throughout the operating block is maintained slightly above the normal atmospheric pressure, so that no contaminating air from the exterior can leak in. From a gallery surrounding the circular operating room, medical students may watch the surgeon at work through a glass dome. Even the operating-room lamps are placed outside the dome. The first of the new operating blocks has been placed on exhibition in Paris, and will later be installed in the medical center at the city of Lille, France.



## Pictures Show Lightning Bolt Is a Succession of Flashes

TO SOLVE the mysteries of lightning, General Electric Company engineers for three years trained a high-speed camera upon the countless bolts that harmlessly strike the Empire State Building in New York City. What appears as a single flash, as shown in the lower part of the view at right, is often a succession of flashes within a fraction of a second, as indicated by the high-speed camera's version of the same bolt at the top.

## Handy Photo-Enlarging Mask



Using the mask to control light for an enlargement

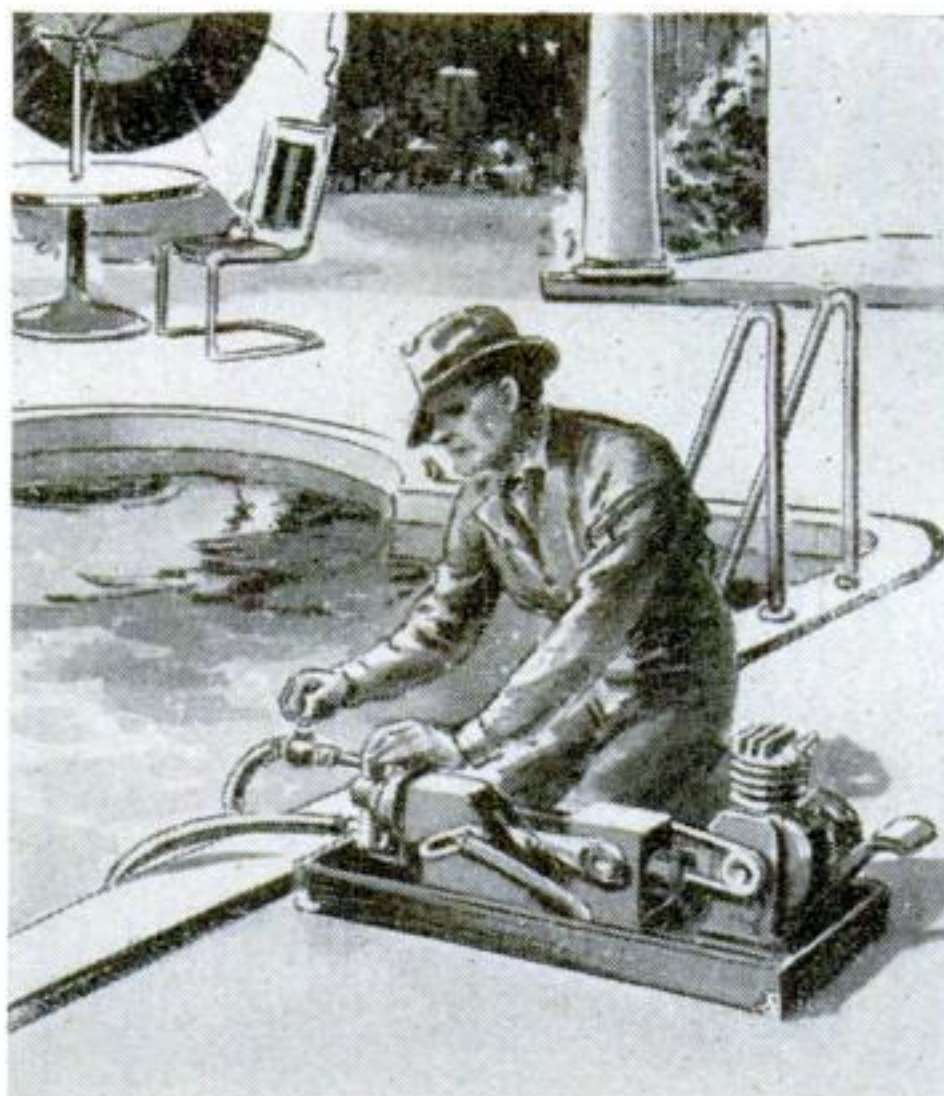
When "dodging" or overexposure of certain parts of photographic prints is required, a handy new mask replaces improvised paper cut-outs to aid photographers in making enlargements. Turning a disk on the orange-tinted screen opens an aperture of any desired shape. By holding this window over the paper during a part of the exposure, only a part of the negative is allowed to print through.



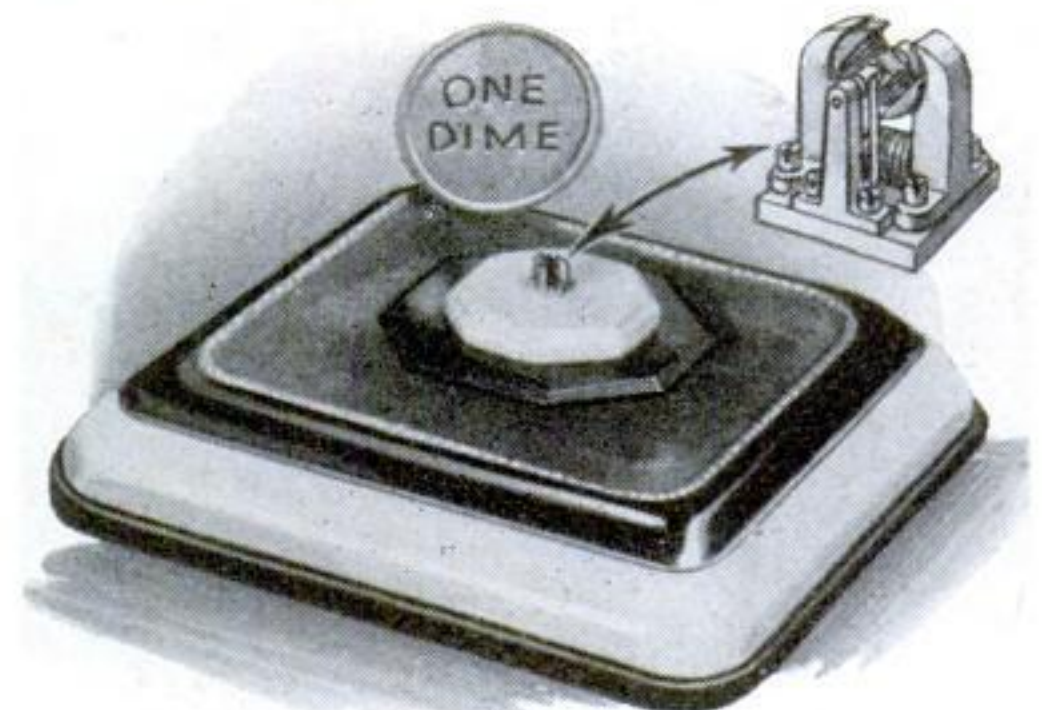
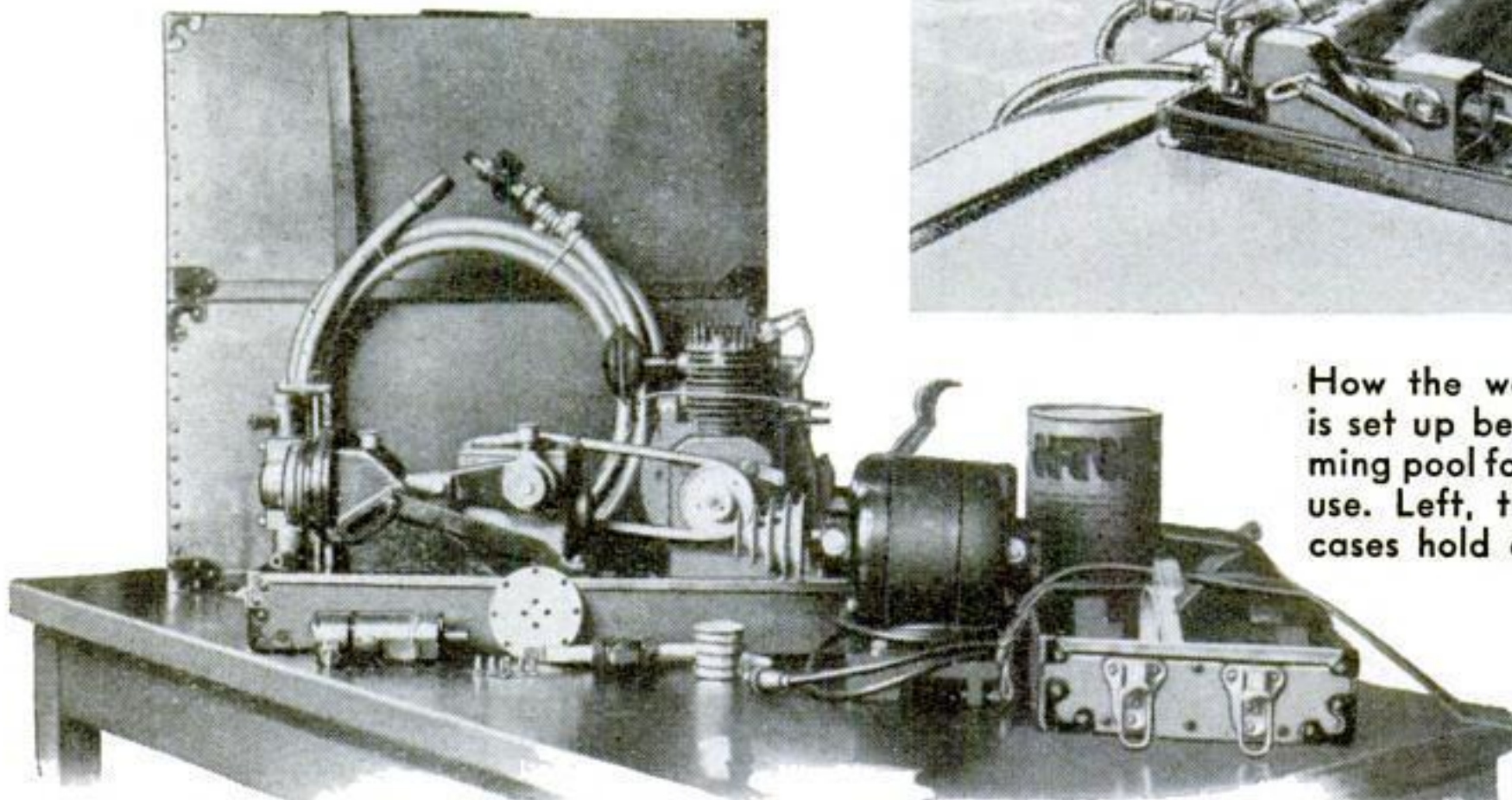
Appearing to an ordinary camera as a single flash, the same lightning bolt, caught in upper picture by a special camera, proves to consist of many flashes

## Portable Pump Disinfects Swimming Pools

DRIVEN by a light gasoline engine, a complete portable chlorinator has been designed as a stand-by or temporary replacement, in case of a breakdown in the water-disinfecting apparatus used at swimming pools and elsewhere. Compact enough to be packed in two suitcases, it may be lifted into the back of a car and transported in a jiffy to a place where it is needed. A small gasoline engine included in the outfit drives a pump that feeds the chlorine or other disinfectant into the water.



How the water purifier is set up beside a swimming pool for emergency use. Left, the two suitcases hold all the parts

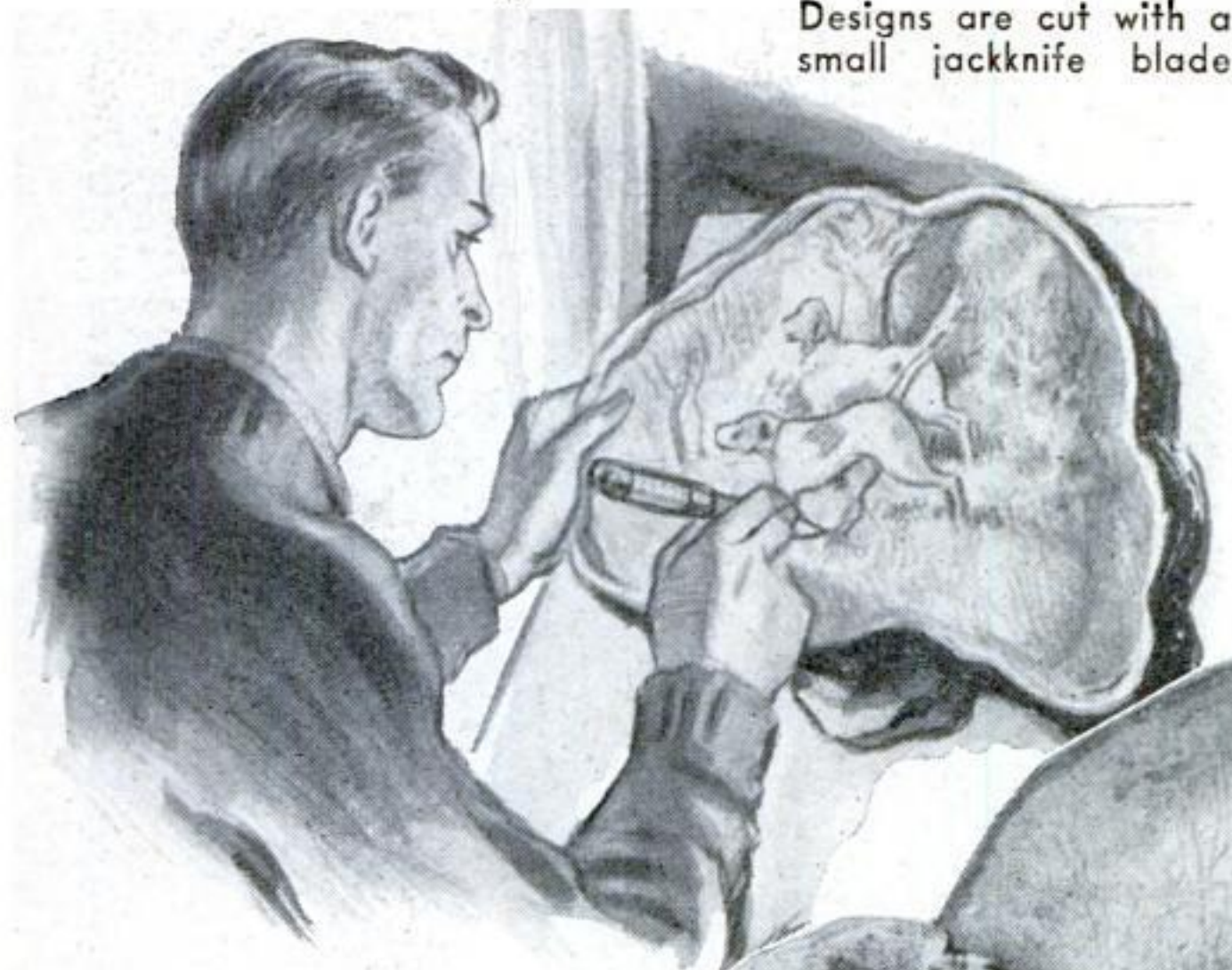


## Tiny Electric Motor Is Dwarfed by a Dime

SO SMALL that a powerful magnifying glass is needed to see it running, an electric motor no larger than the head of a safety match has just been completed by Merl Bassett, of Kelso, Wash. Dwarfed by a dime, the miniature masterpiece is shown above in the jeweler's ring box that serves it as a case, while a greatly enlarged drawing illustrates its design. The tiny single-phase motor runs on sixty-cycle alternating current at three tenths of a volt, supplied by a transformer connected to the house wiring. After being started by a twirl with a toothpick, the rotor spins under its own power at a speed of 3,600 revolutions a minute.



# Artist Engraves Pictures on Fungus as Novel Hobby



Designs are cut with a small jackknife blade



At the left are seen two remarkable hunting scenes engraved on fungus, by William H. Foster, of Andover, Mass. Striking effects are produced in contrasting shades of light and dark. In the picture below, Foster is seen collecting fungus for carving

**E**NGRAVING on large fungus plants of the kind commonly found on forest trees is the unusual hobby devised by William H. Foster, Andover, Mass., artist. Delicately cutting the soft surface of his novel medium with the sharp point of a jackknife, he obtains striking effects in contrasting shades of light and dark, as in the remarkable hunting scenes reproduced here. Some of his finished works of art are hung flat on the wall like pictures,

while others are mounted on blocks of field stone for mantel display. The unusual carvings are said to retain their freshness indefinitely. Whenever he needs a fresh supply of material, a trip through the woods with a chisel provides it.



## Postage Stamps in Lockets Are Jewelry Fad

POSTAGE stamps, placed in lockets, are the latest in ornaments for jewelry. A film actress introduced the fad with a bracelet of stamps from foreign fan letters, and it may also find favor among stamp collectors as a way of showing off rarities.



Ann Miller, film actress, with a bracelet of postage stamps

## Tester Shows If Peas Are Tender

How tender are peas? To find out, the odd machine illustrated at the right has been designed for canners. Peas for the test are placed in a hopper, and the force required to shear through them is indicated by the travel of a moving pointer across an illuminated scale at the top, the amount of the movement indicating the freshness.

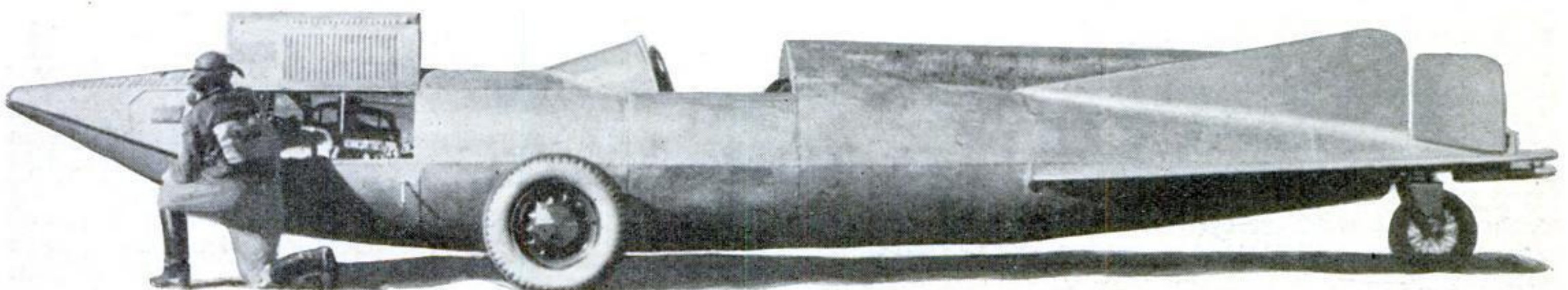


How peas are put in the hopper of the machine

## High-Speed Armored Car Looks Like a Plane

RESEMBLING an airplane without wings, even to an air rudder at the rear, a high-speed armored car designed by a World War veteran would offer a small target to enemy gunners as it raced forward in a headlong attack, spouting machine-gun bullets from its tapered

nose. Bulletproof sheathing would protect the pilot and the tires of the three-wheeled "land plane," of which the inventor, William Clark, of Enid, Okla., has just completed the full-size model of the formidable land weapon illustrated below.



Full-size model of the "land plane" invented by William Clark, of Enid, Okla., for use in machine-gun attacks. The gun is in the nose





Motor-driven atomizer in use to cover bathers' skin with a special milk spray

## Milk Spray Aids Sun Tan

BATHERS at Willow Lake, near Glendale, Calif., have adopted mass-production methods to speed up the process of acquiring coveted coats of sun tan. They employ a motor-driven atomizer to apply a newly developed milk spray, which is said to protect the skin from unaccustomed exposure to the sun's rays and to help prevent burning and peeling.

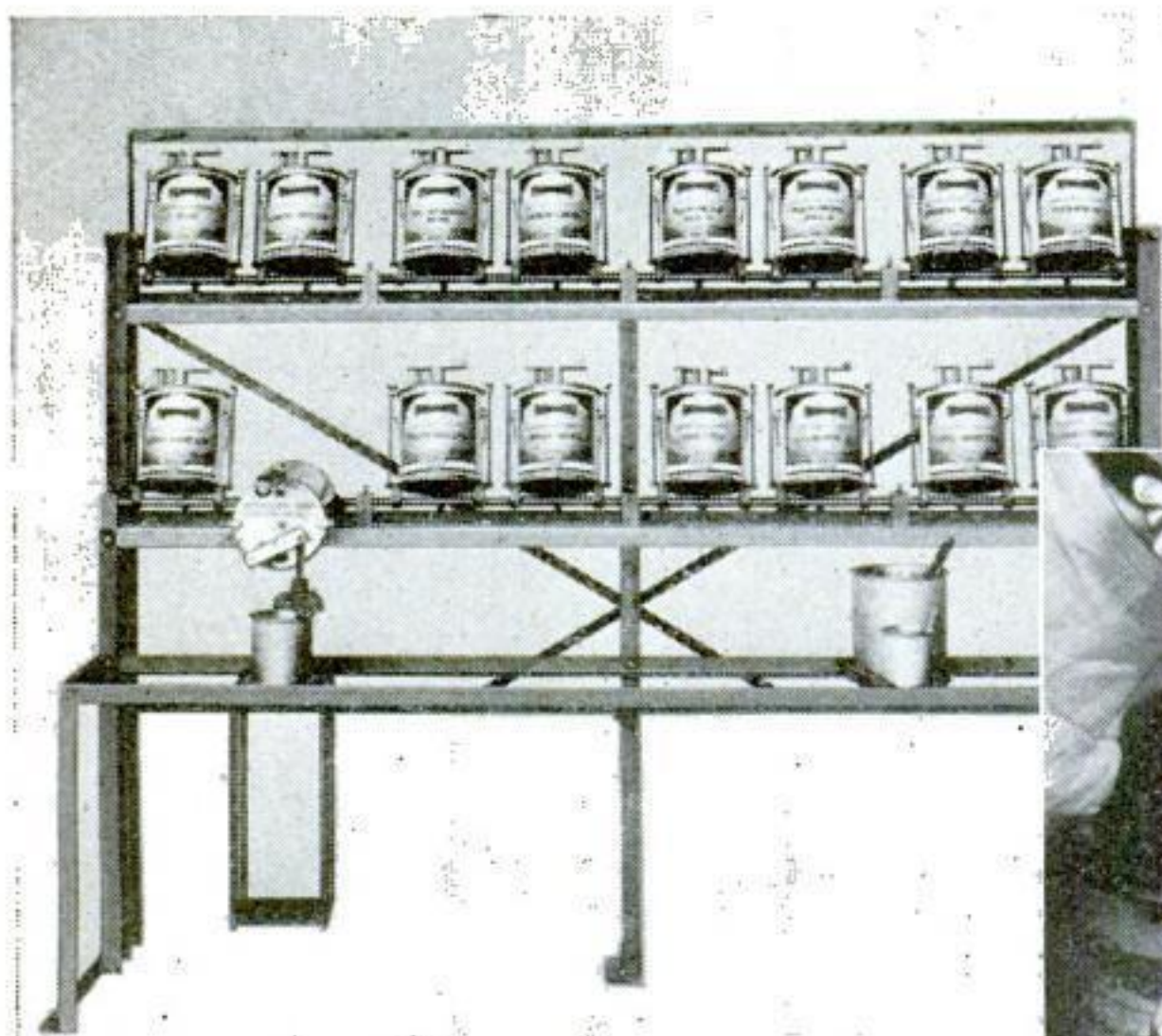
## Buttons Tune Low-Cost Car Radio

PUSH-BUTTON tuning, the modern safety feature that enables car drivers to adjust their radios without taking their eyes from the road, has now been built into an inexpensive, easily installed set. Pushing any one of five buttons on an instrument-board panel instantaneously tunes the self-contained receiver to a corresponding station.



Pressing one of the five buttons on this easily installed set tunes the desired station

## Paint-Mixing Rack Matches Car-Body Colors



Sixteen cans on the rack at left contain the ingredients for any car-body color

Below, paint being poured from a can. Note shut-off valve and agitator shaft



PAINTS used on all makes and models of American motor cars from 1933 to the present time may be matched accurately with a new color-mixing machine for garages and body-repair shops. Sixteen swivel-mounted cans, each one provided with an agitator and a shut-off valve, are so arranged that any formula called for by a master chart of directions may be quickly measured out, making it unnecessary to carry hundreds of shades in stock.



## Germs Are Destroyed by "Peanut Whistle"

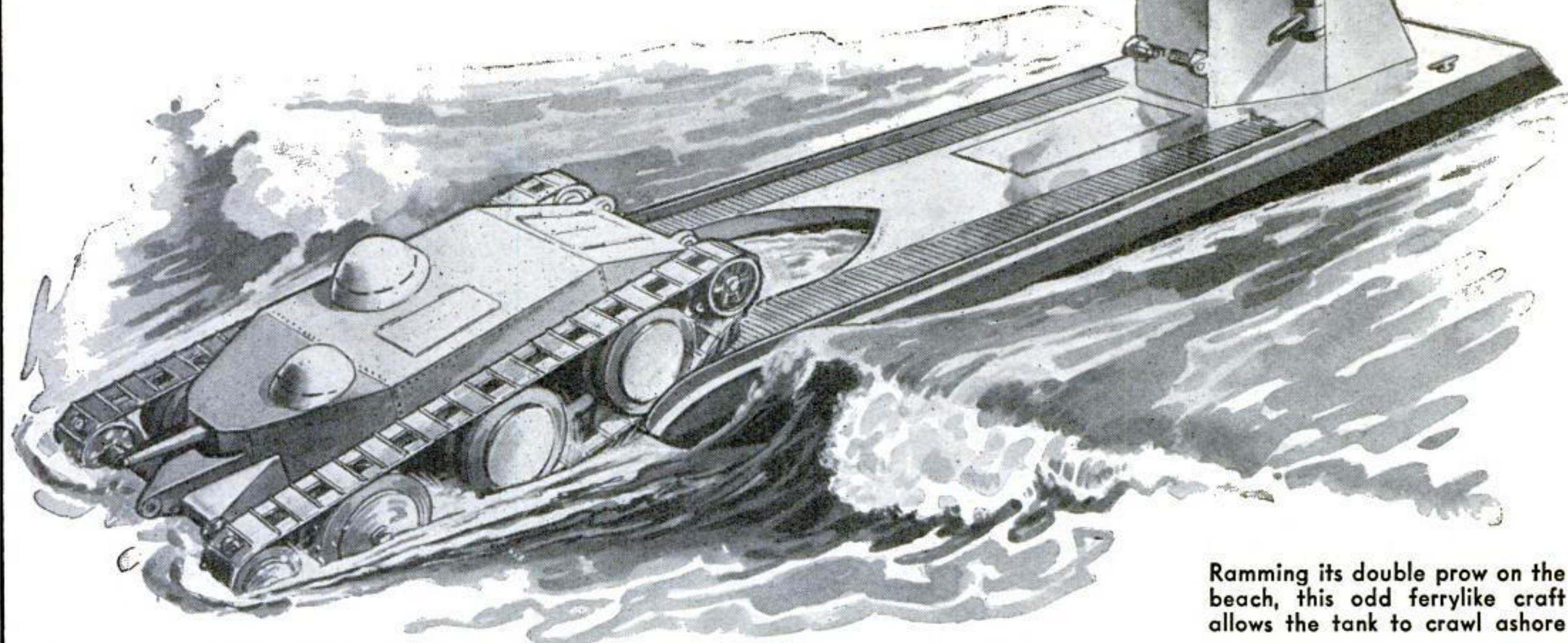
DESTROYING typhoid and other germs by exposing them to a shrill tone two octaves above piano range, produced by the "peanut-roaster" whistle shown above, is the reported accomplishment of Dr. Leslie Chambers, Philadelphia, Pa., research worker. The novel weapon may find use in the war on disease.



# Monitor Speedboat Lands War Tanks Under Fire

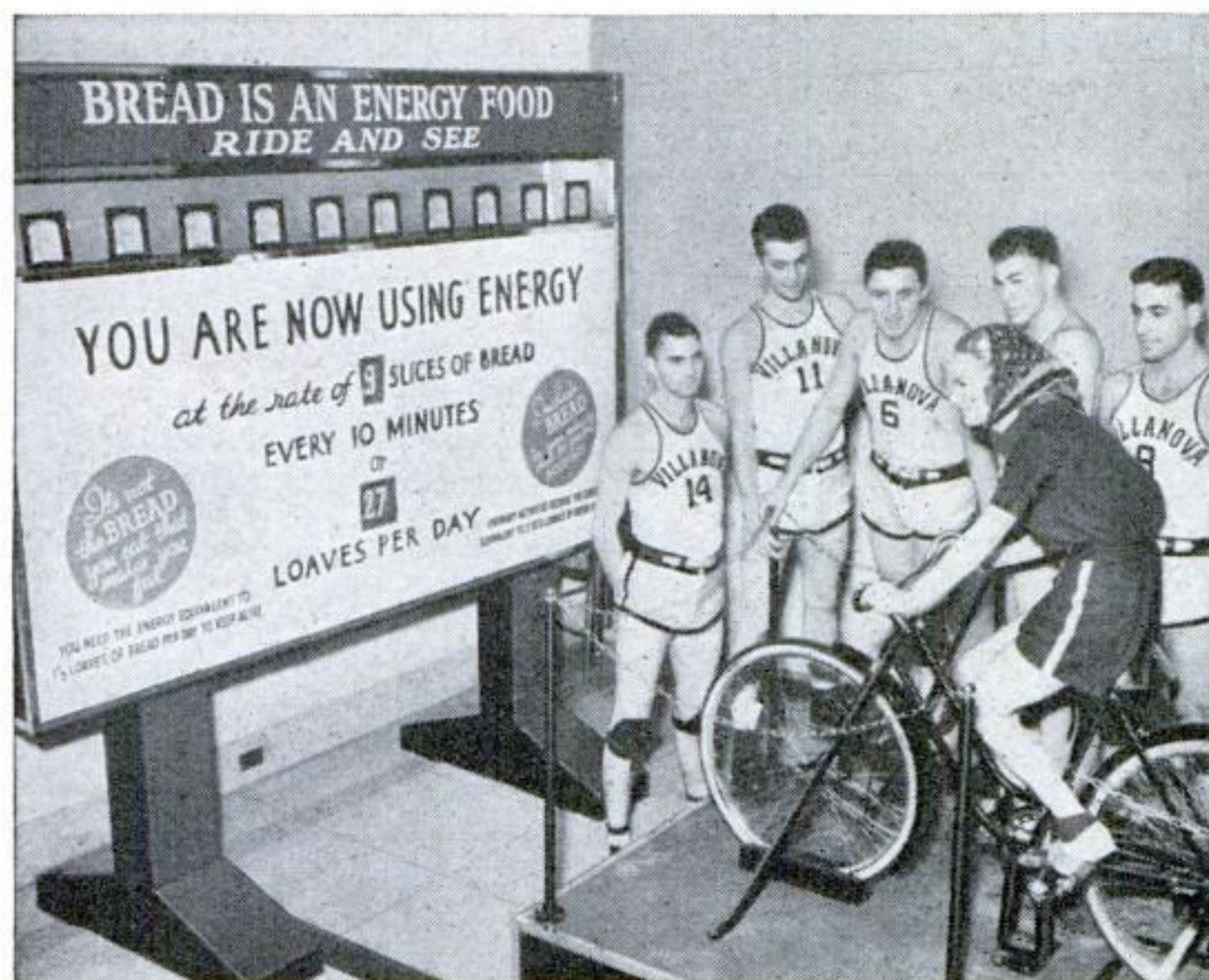
**D**ESIGNED to land a war tank ready for action, from a ship that may be several miles offshore, a unique forty-foot armored launch has been constructed at Portsmouth, Va., for tests by the U. S. Navy. Bearing the vehicle upon its flat, monitorlike

deck, the speedboat may be driven right up on the beach without damaging its propellers, and the tank crawls ashore. The boat then backs off for another load, defending itself with a pair of machine guns in its steel-sheathed conning tower.



Ramming its double prow on the beach, this odd ferrylike craft allows the tank to crawl ashore

## Meter Gauges Work in Bread-Slice Units



As the bicycle is pedaled, the board shows the food energy spent

How rapidly exercise uses up the energy in the food you eat is graphically demonstrated by a device called the "bread-o-meter" at the Franklin Institute in Philadelphia, Pa. When a visitor mounts a bicycle frame and pedals vigorously, a generator produces electricity in proportion to his effort, and figures on a board show how many slices or loaves of bread would be needed to furnish this energy.



## Novel Cutting Tool Aids Metal Workers

**MAKING** short work of cutting flat or corrugated sheet metal, a new tool shown above aids in repairing automobile bodies, installing warm-air furnace systems, and turning out signs and stencils. When its sharp, hook-shaped cutting point is held against the metal and the implement is tapped with a hammer, it makes a clean slit along any straight or curved line called for by the work in hand.

## Flash Lamp Lights Maps for Easy Reading

**DETAILS** of maps are made clearly visible by a new flash lamp that may be set anywhere on the chart, directing light downward upon it from a bulb in an extension reflector. The handy aid is especially useful when a large number of voluminous maps must be consulted, making it unnecessary to carry them to a place where the light is more suited for examination.



Map lamp in use. An extension reflector throws light downward

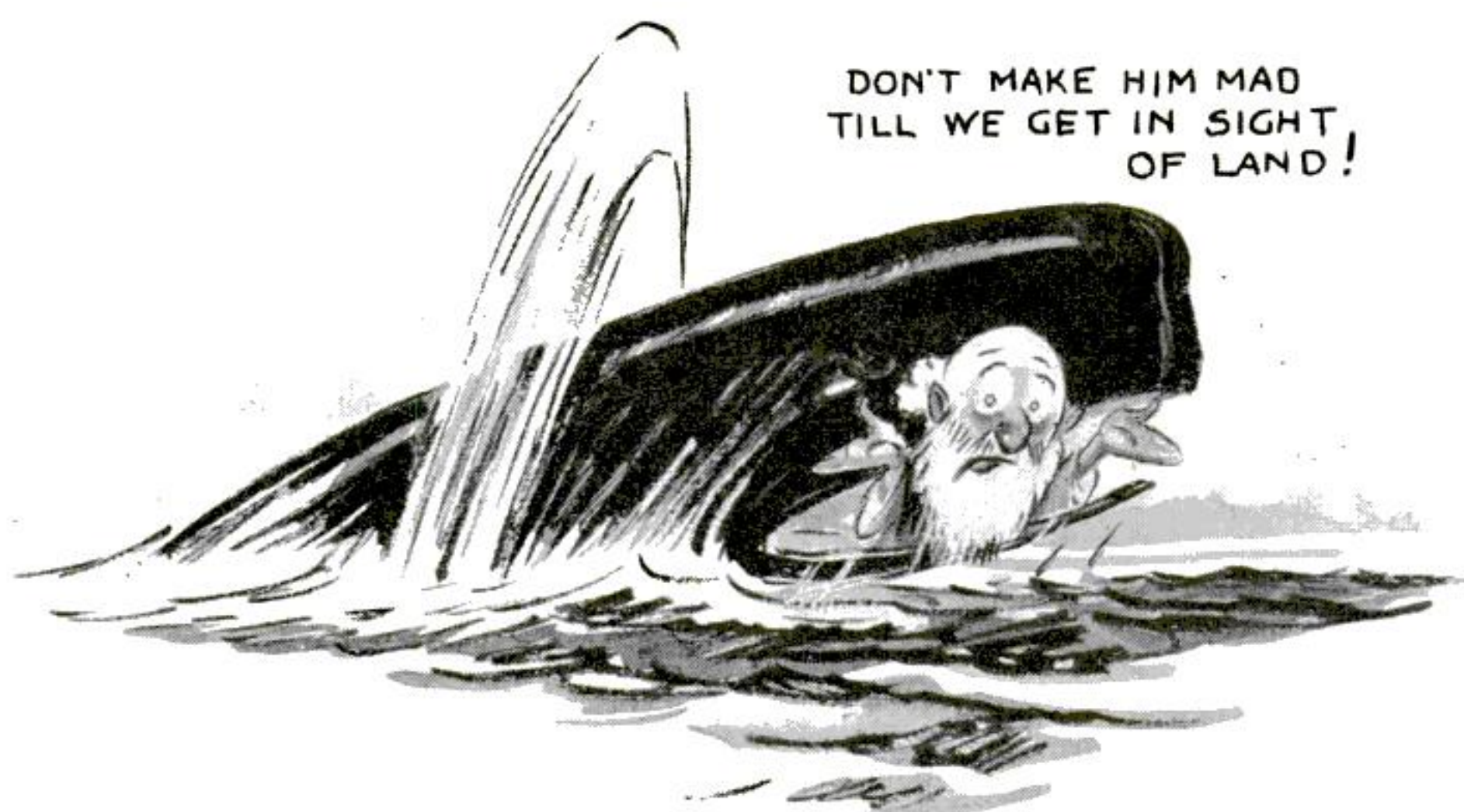


# POPULAR SCIENCE

## Question Bee

How well acquainted are you with the language and the facts of science? You'll enjoy testing yourself this entertaining way. There is one correct answer for each of the twenty-five

numbered questions below. See if you can find it, keeping a list of the corresponding letters. Then compare your list with the correct one on page 119 and add up the points for your score



- 1 Whales are (a) reptiles (b) fish (c) mammals (d) amphibians.
- 2 Radio sets use (a) Venturi tubes (b) audion tubes (c) Eustachian tubes (d) inner tubes (e) capillary tubes.
- 3 Knowing the length of two sides of a right triangle, you can compute the length of the third side by means of (a) the 5-5-3 ratio (b) the law of torts (c) the Pythagorean theorem (d) Foster's rule of eleven (e) the Einstein theory.
- 4 To cut off the ends of wooden strips at a uniform slant, you should use (a) a countersink (b) an angle iron (c) a rabbet plane (d) a miter box (e) a cold chisel.
- 5 Seeds of the sort called "Mexican jumping beans" bounce about because of (a) a musclelike mechanism for scattering them widely (b) their responsiveness to atmospheric electricity (c) the spasmodic twitching of a small parasitic caterpillar in the seed.
- 6 After development is complete, you should put photographic film in (a) boiling water (b) hypo (c) aqua regia (d) cotton batting (e) gamboge.
- 7 Compressed-air workers who dig vehicular tunnels are popularly called (a) ground hogs (b) road hogs (c) sandhogs (d) Bessemer pigs.
- 8 The weather man calls rain and snow (a) hypothecation (b) precipitation (c) decantation (d) insolation.

- 9 Instead of lenses, some of the largest astronomical telescopes use (a) sky filters (b) Nicol prisms (c) planetary gears (d) concave mirrors.
- 10 Ohm's law (a) entitles you to be considered innocent until you are proved guilty (b) shows the effect of pressure upon the volume of a gas (c) explains the workings of economic supply and demand (d) sums up in a simple formula the relationship between electric voltage, current, and resistance.
- 11 Mariners reckon their longitude from (a) the Rome-Berlin axis (b) the Greenwich meridian (c) the equator (d) the line of syzygies.
- 12 You can use linoleum for making (a) bromide prints (b) fingerprints (c) block prints (d) blueprints.
- 13 The Arctic lemming is noted for (a) the fact that it is six months long (b) suicidal migrations in which hordes of the rodents march into the sea and perish (c) its marvelous arches and streamers of colored light in the sky.
- 14 What enables some insects to walk on water is (a) aqueous tension (b) surface tension (c) nervous tension.
- 15 Automatic sprinkler systems use (a) fire plugs (b) spark plugs (c) fusible plugs.
- 16 The banging noise you hear in steam-radiator pipes is called (a) water hammer (b) foot pound (c) carbon knock.

17 Resolving power means (a) strength of will (b) clearness as well as magnification in what you see through a microscope or telescope (c) a number like the 7 in  $10^7$ .

18 C. G. S. stands for (a) an alloy of copper, gold, and silver (b) the centimeter-gram-second system of units (c) "cum grano salis."

19 The boundary between the cold air of high latitudes and the warmer air of lower latitudes is called a (a) rising front (b) united front (c) polar front (d) popular front.

20 A dashpot (a) keeps glue ready for use (b) requires a player to have jacks or better to open (c) acts as a shock absorber in machinery.

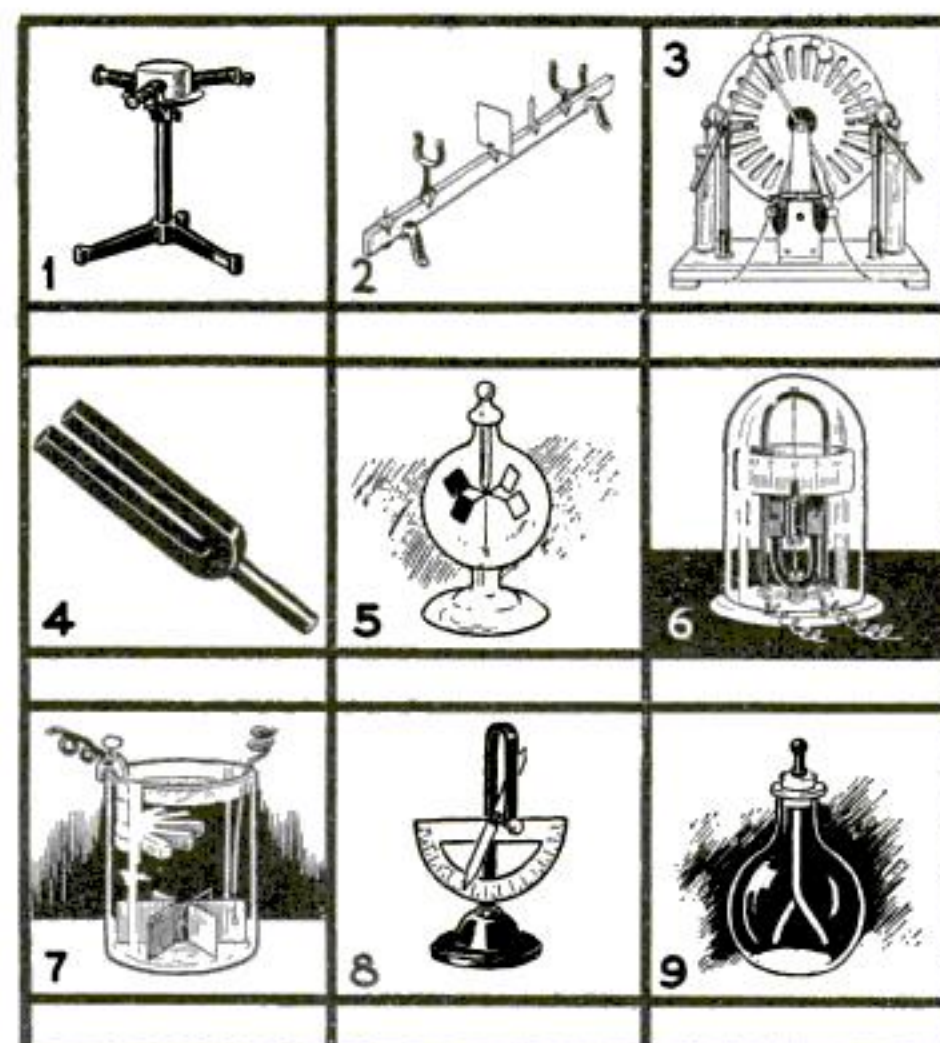
21 The man who invented dynamite is more generally remembered for (a) designing the Diesel motor (b) building the Panama Canal (c) founding the Nobel prizes (d) writing "Alice in Wonderland."

22 Mutineers from the British ship *Bounty* founded a colony of great interest to anthropologists upon (a) Long Island (b) Easter Island (c) Pitcairn Island (d) the Isle of Capri.

23 A small hand tool bearing several notches and terminating in a sharp-edged steel wheel is used to (a) open soft-boiled eggs (b) remove paint from woodwork (c) strip insulation from electric wires (d) cut glass.

24 The moon has no (a) water (b) gravity (c) sunlight (d) mountains.

25 Storage batteries should be replenished from time to time with (a) ammonia water (b) distilled water (c) Javelle water (d) carbonated water.



Here are some of the tools you might expect to find in a physics laboratory. Try to label the pictures correctly from the list below. Answers are on page 119

radiometer    wet cell    tuning fork  
galvanometer    Wimshurst machine  
dipping needle    optical bench  
electroscope    spectroscope



# Un-Natural History

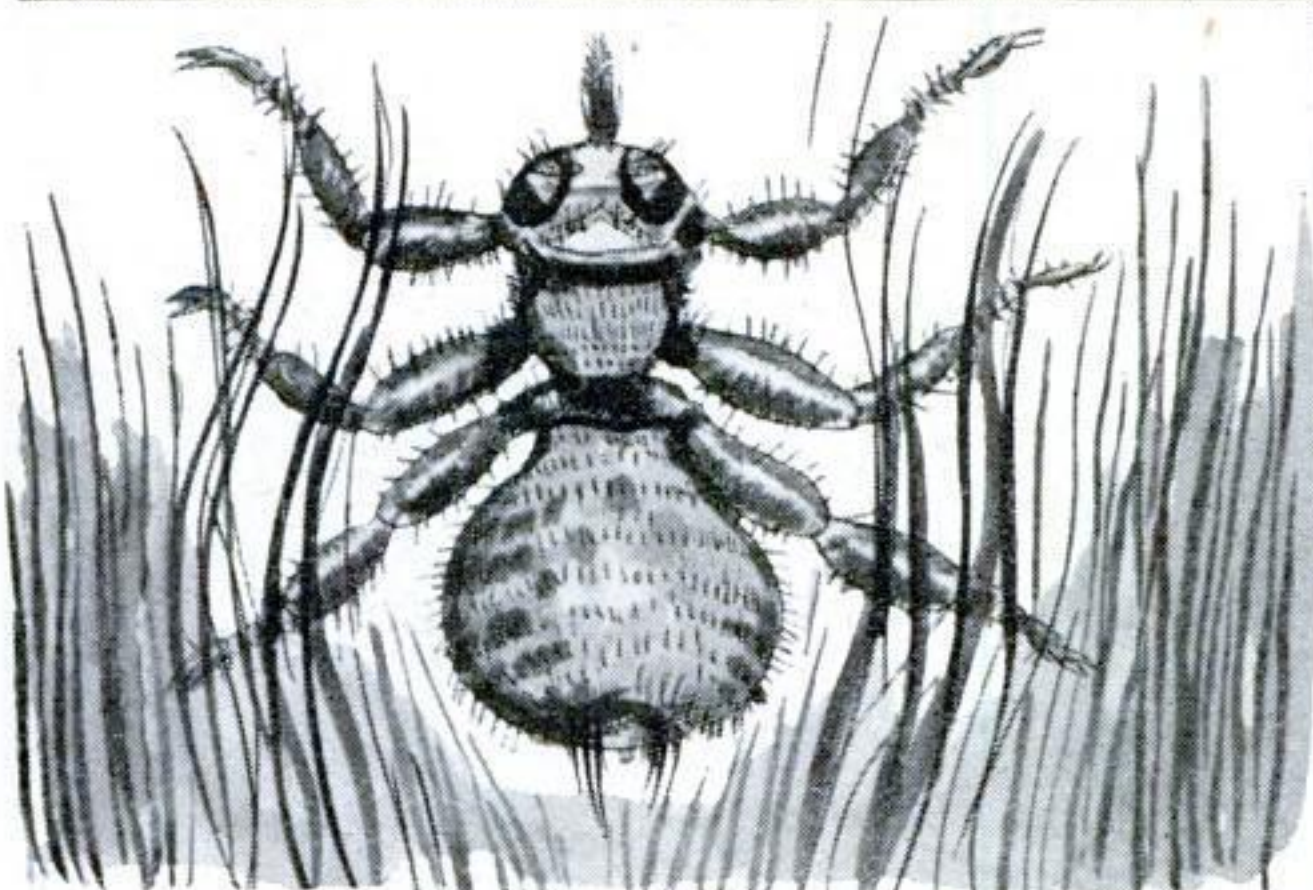
By  
GUS MAGER



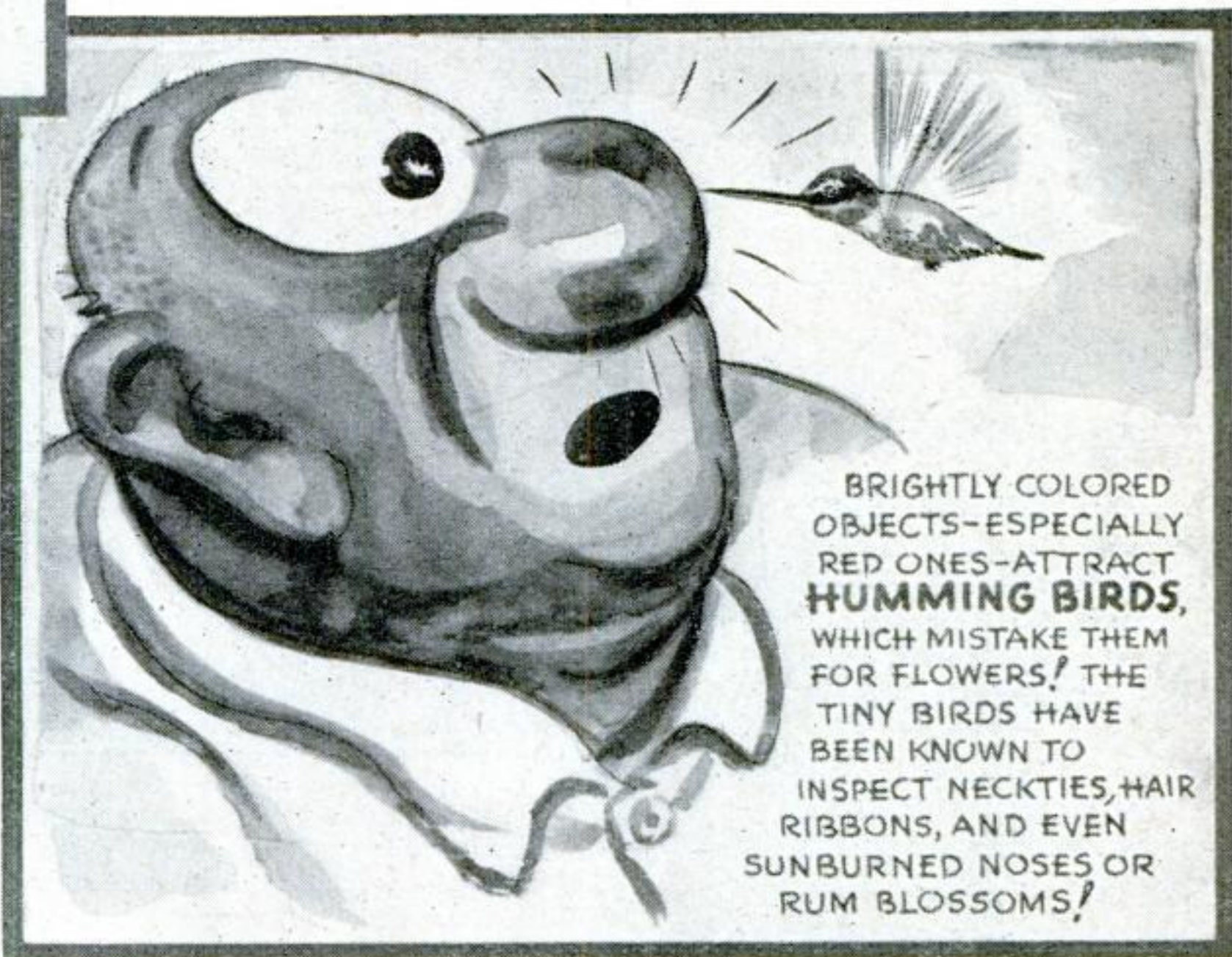
THE GROWTHS ON A **GIRAFFE'S** HEAD ARE NOT LIKE THE HORNS OF OTHER ANIMALS, BUT BONE COVERED WITH HAIRY SKIN! MOST GIRAFFES HAVE TWO OF THEM, PLUS A POTATOLIKE BUMP ON THE FOREHEAD, BUT A SPECIMEN RECENTLY DISCOVERED IN UGANDA HAS TWO EXTRA HORNLIKE GROWTHS BEHIND ITS EARS!



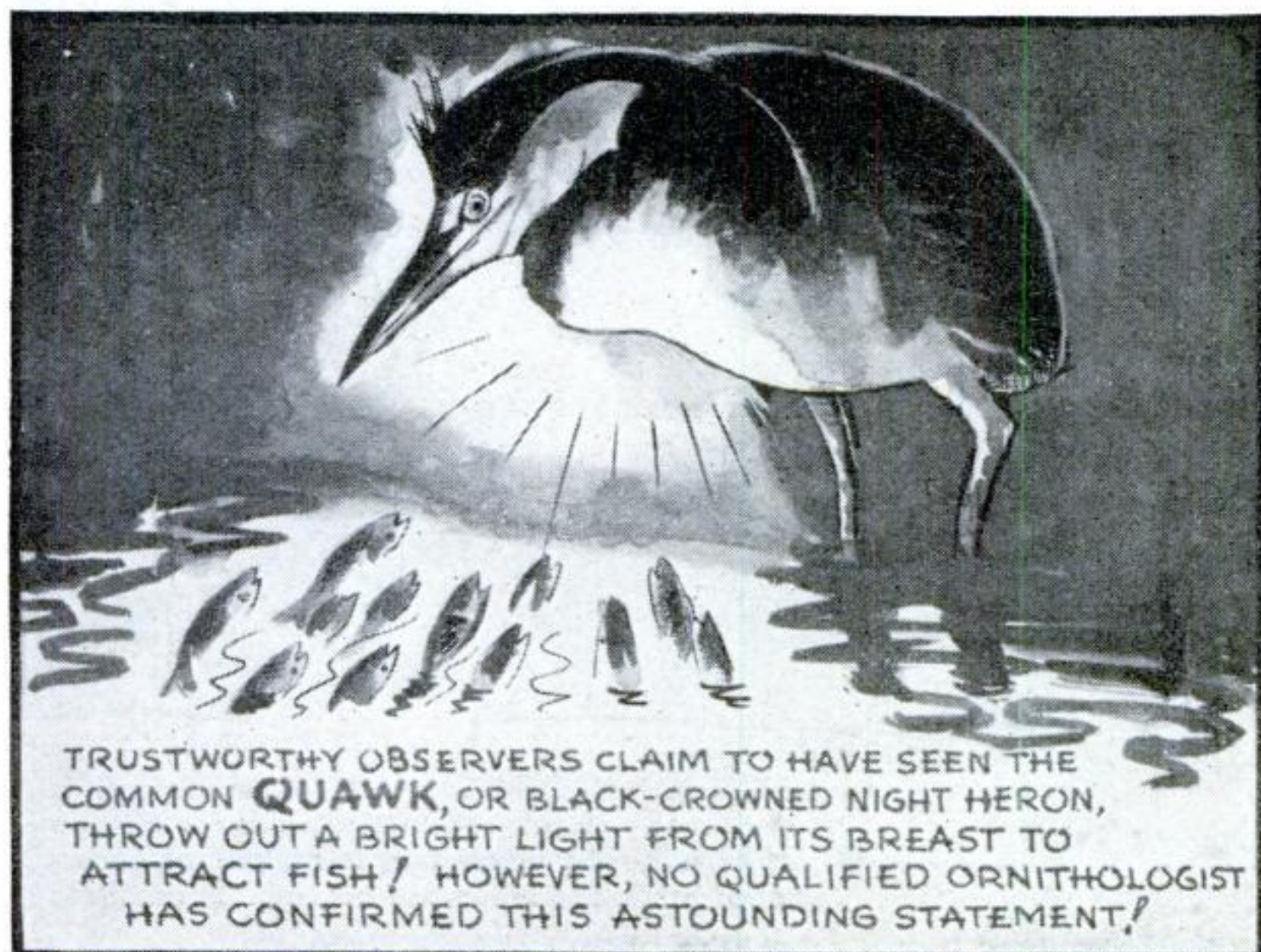
WILD HERDS OF **GIRAFFES** IN CENTRAL AFRICA WERE NEARLY EXTERMINATED BY THE WORLD WAR! BECAUSE THE GALLOPING ANIMALS KEPT WRECKING MILITARY TELEGRAPH LINES, SOLDIERS OF THE BRITISH AND GERMAN COLONIAL ARMIES WERE ORDERED TO SHOOT THEM ON SIGHT! SINCE THE WAR, STRICT PROTECTION HAS RESTORED THEIR NUMBERS!



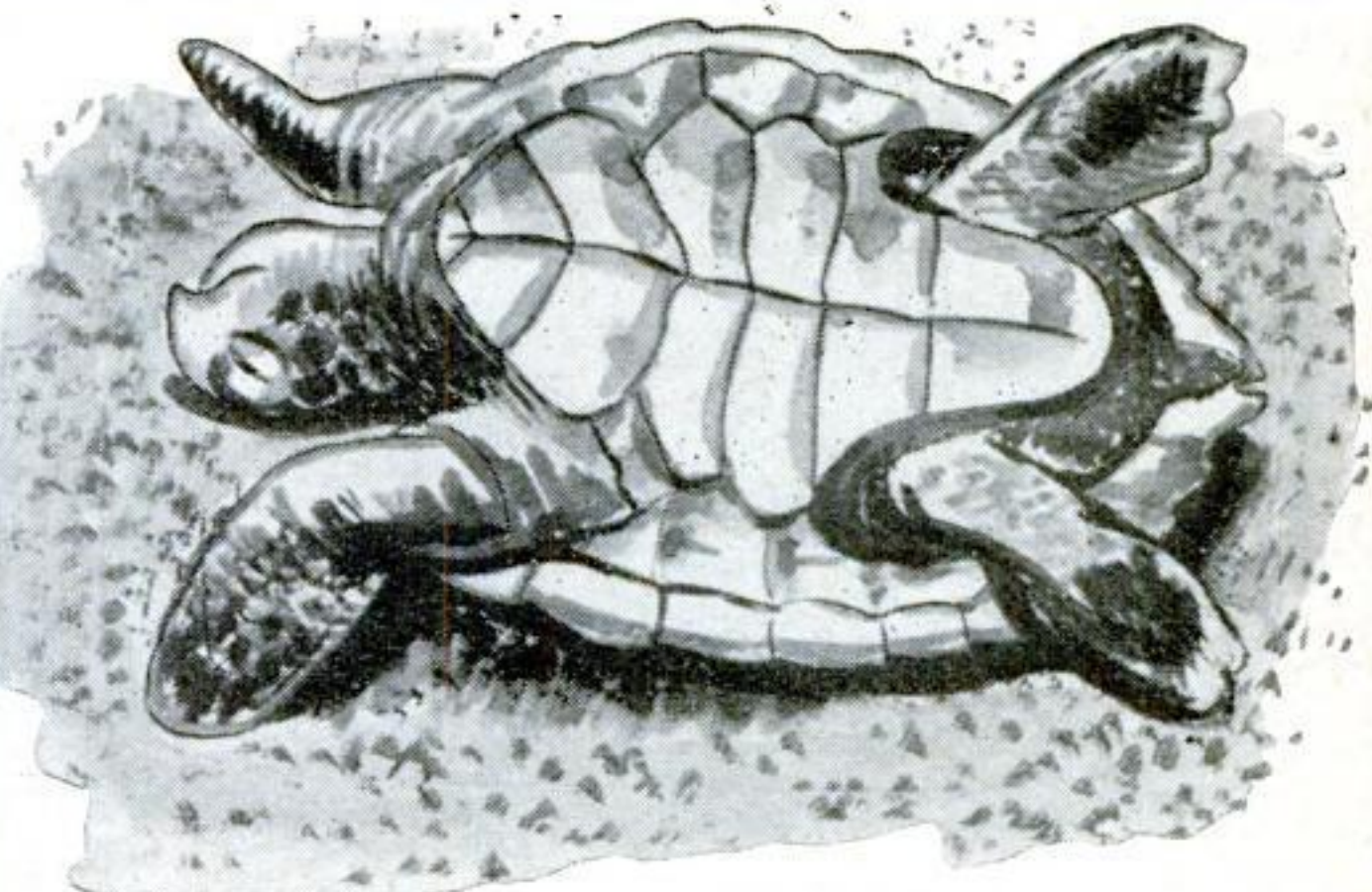
ONE SPECIES OF **PARASITIC FLY** HITCH-HIKES ON BIRDS UNTIL IT GETS A CHANCE TO TRANSFER TO A DEER OR OTHER MAMMAL! THEN IT BITES OFF OR CASTS ITS WINGS, AND LIVES HAPPILY EVER AFTER!



BRIGHTLY COLORED OBJECTS-ESPECIALLY RED ONES-ATTRACT **HUMMING BIRDS**, WHICH MISTAKE THEM FOR FLOWERS! THE TINY BIRDS HAVE BEEN KNOWN TO INSPECT NECKTIES, HAIR RIBBONS, AND EVEN SUNBURNED NOSES OR RUM BLOSSOMS!



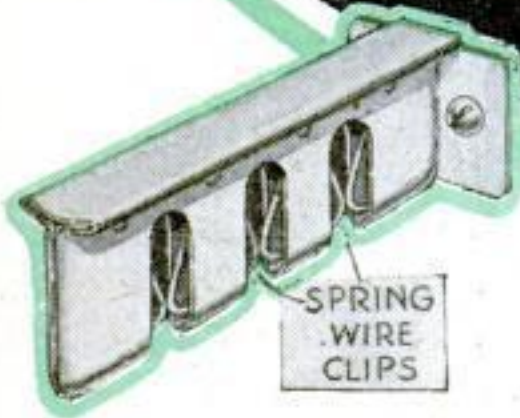
TRUSTWORTHY OBSERVERS CLAIM TO HAVE SEEN THE COMMON **QUAWK**, OR BLACK-CROWNED NIGHT HERON, THROW OUT A BRIGHT LIGHT FROM ITS BREAST TO ATTRACT FISH! HOWEVER, NO QUALIFIED ORNITHOLOGIST HAS CONFIRMED THIS ASTOUNDING STATEMENT!



IF YOU EVER CATCH A **SEA TURTLE** OUT OF WATER AND WANT TO KEEP HIM ALIVE, TURN HIM OVER ON HIS BACK! THE UNDER SHELL IS SO SOFT THAT THE TURTLE'S GREAT WEIGHT COMPRESSES THE INTERNAL ORGANS AND SOON CAUSES DEATH! UNDER WATER, OF COURSE, IT'S DIFFERENT!



# New Inventions



**TRIPLE TOWEL HOLDER.** Spaced properly on the kitchen or bathroom wall, twin brackets have slots that grip towels or cloths for fast drying



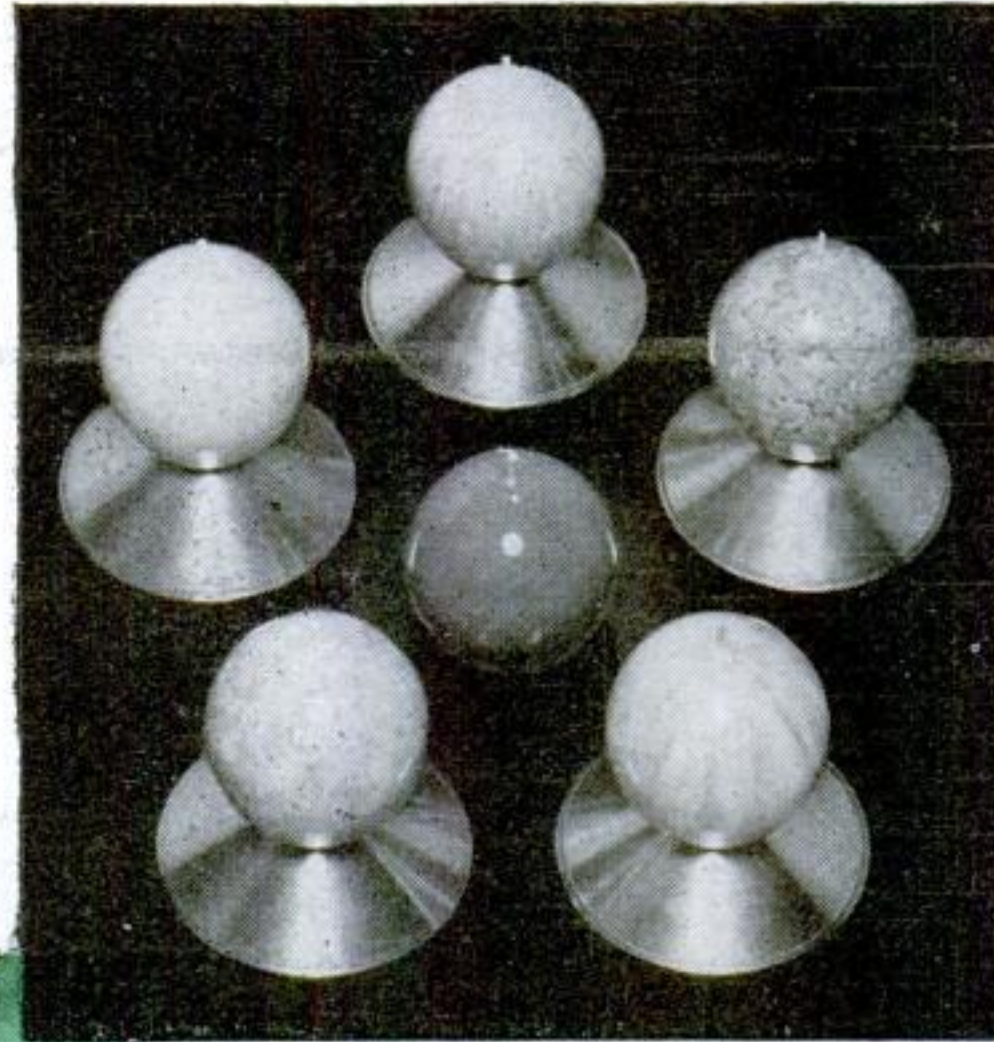
## HANDY TABLE GRILL

For broiling meats or fish, baking, and frying without fat, this versatile electric grill can be used in the kitchen or on the dinner table. The tray makes an attractive serving platter, and the lid will serve as a hot plate, as seen below

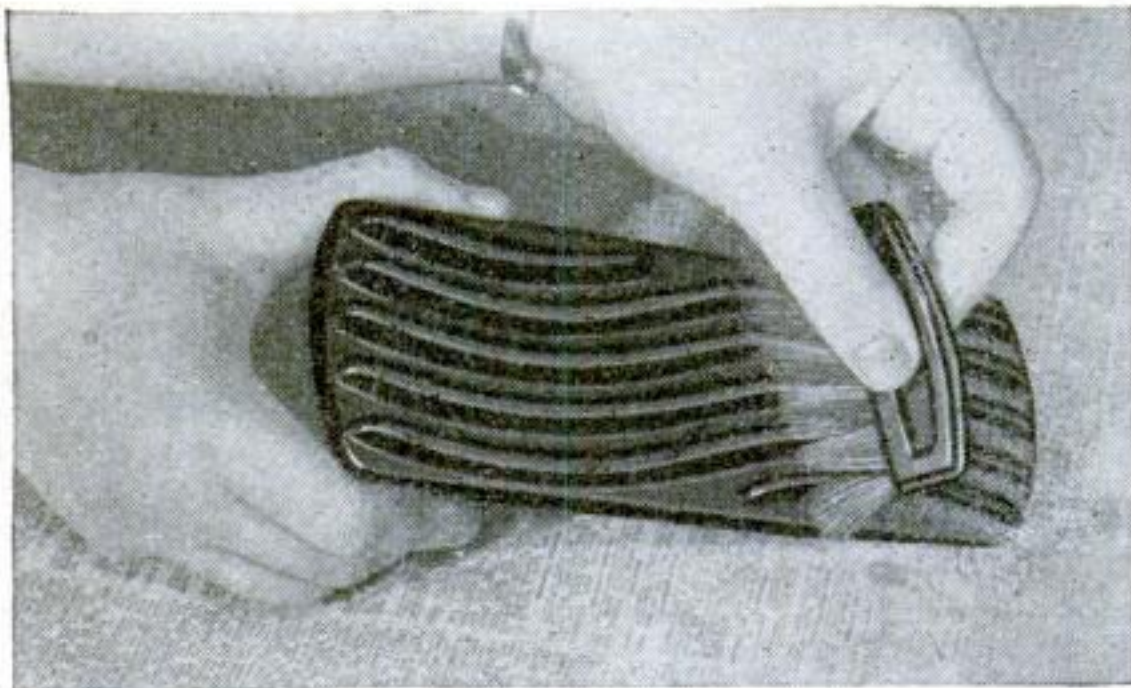


## MODERN KITCHEN SCALES

Molded of plastic material in tear-drop shape, the scales shown below measure pounds and ounces separately on dials seen through windows. Weighs up to twenty-five pounds

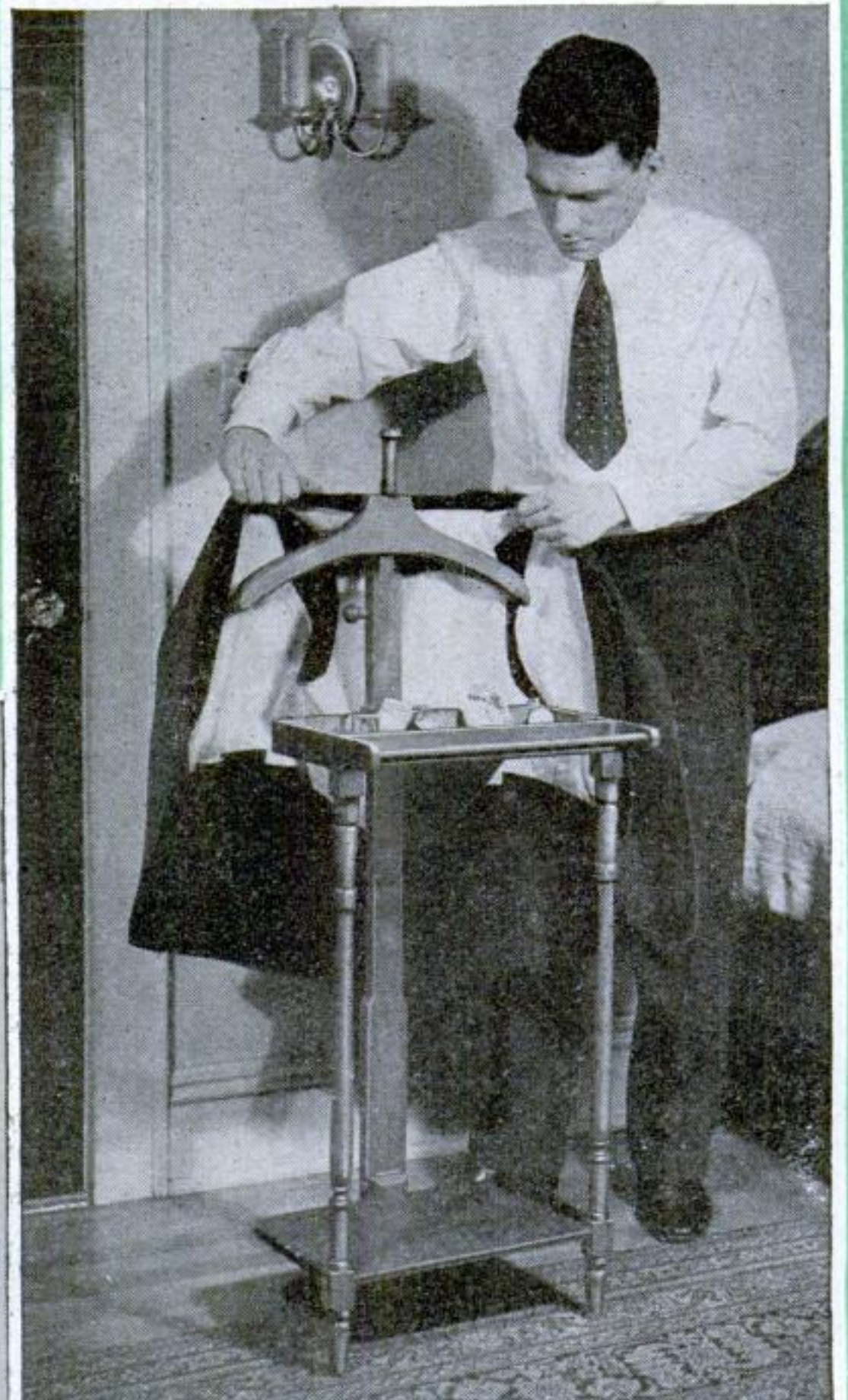


**BIG-APPLE CANDLES.** Suggested by the current dance craze, novelty candles are molded and colored to represent apples. Each candle has an attractive base of metal



## NOVEL UPHOLSTERY CLEANER

Dust loosened by wavy ribs on this hard-rubber cleaning tool as it is brushed over upholstery is attracted by the static electricity generated by friction. Collecting in the hollows, the dust is removed with a brush as shown in the picture above

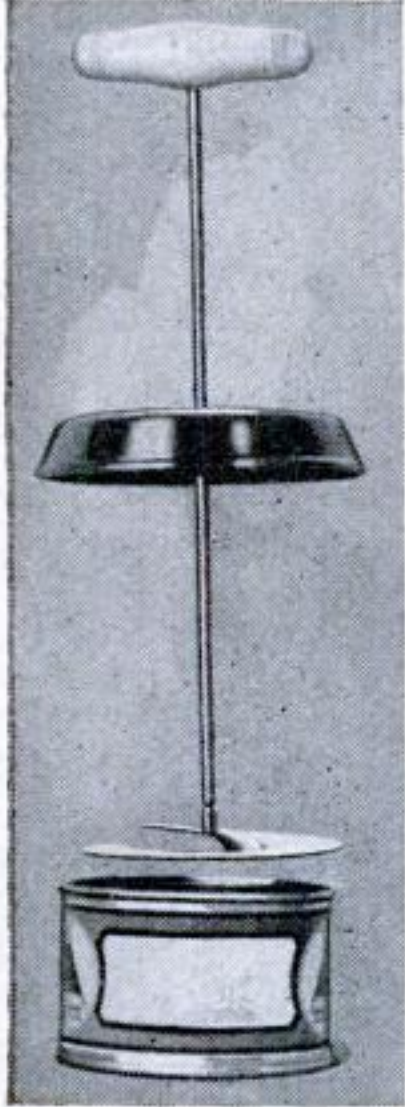


**FOLDING CLOTHES RACK.** A man's suit is held neatly on this rack, which folds for storage as at left. The upper tray is for pocket accessories, while the lower one accommodates shoes

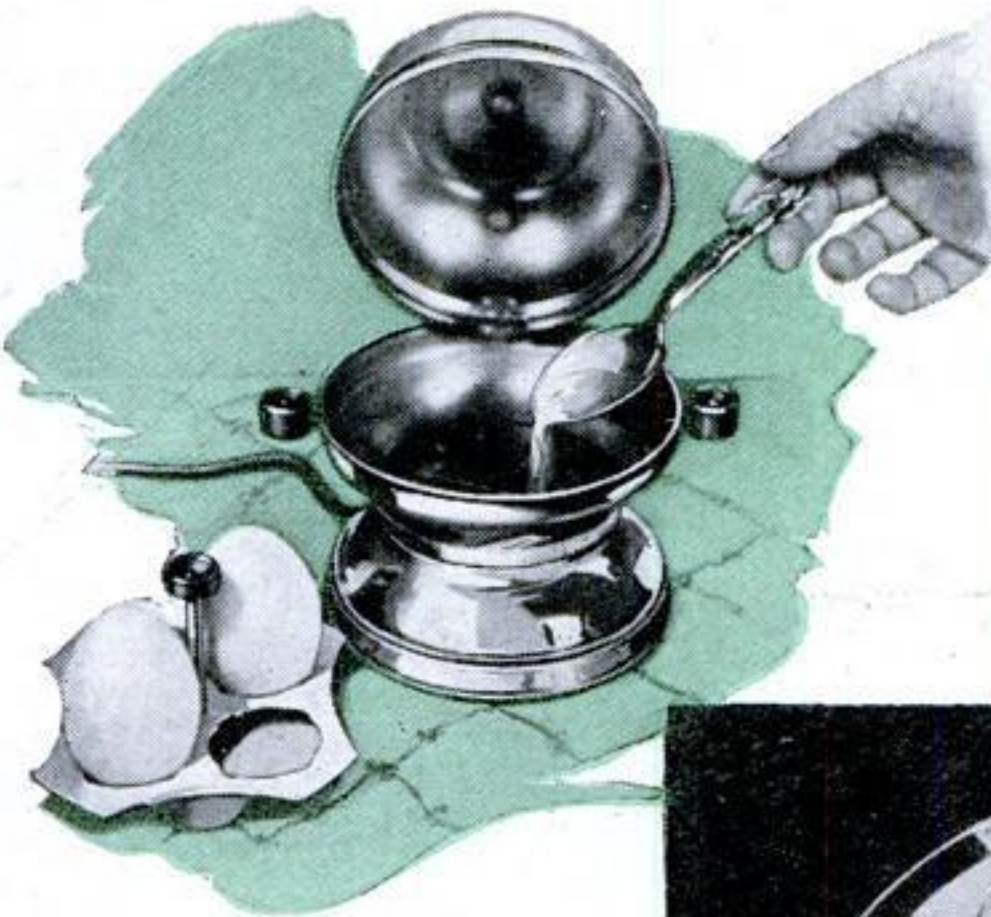


# Lighten Home Chores

**SELF-SHARPENING MINCER.** Straddling a plate with its rubber-toed feet, the device at the right is designed for chopping, grating, or grinding raw foods. The moving blade sharpens itself



**NOVEL EGG COOKER.** An ingenious timing system is employed in the electric egg cooker below. For each minute the eggs are to cook, a teaspoonful of water is put in. At the end of that time, current is shut off automatically, and a warning bell rings



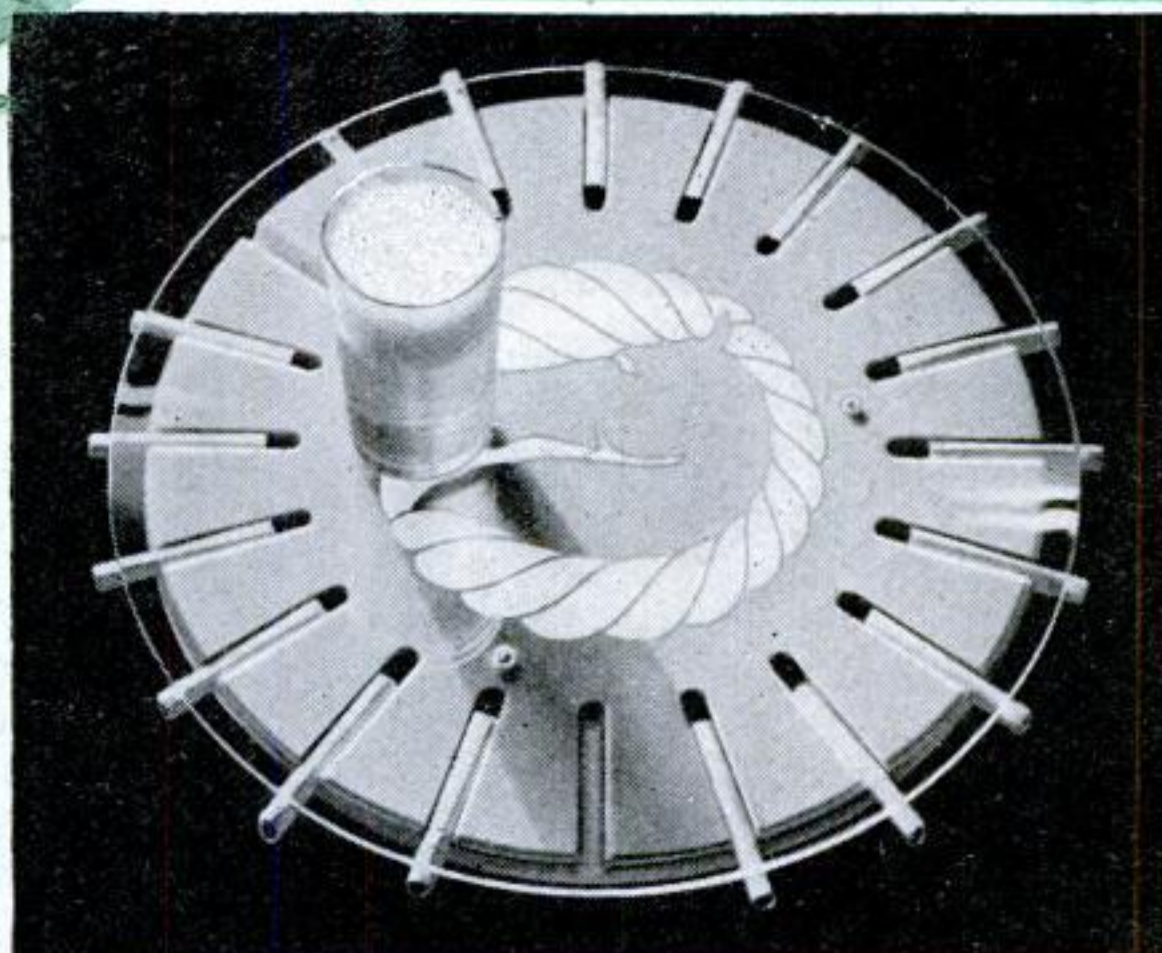
**SLICES MEAT IN THE CAN.** Canned meat or fish is cut into easily removed slices by the spiral blade of this knife. Inserted in the open can, the tool is revolved for cutting



**PORTABLE IRONER.** Operated on a table, the electric ironer above starts and stops by elbow pressure on a lever, leaving hands free. It will even iron a bed sheet



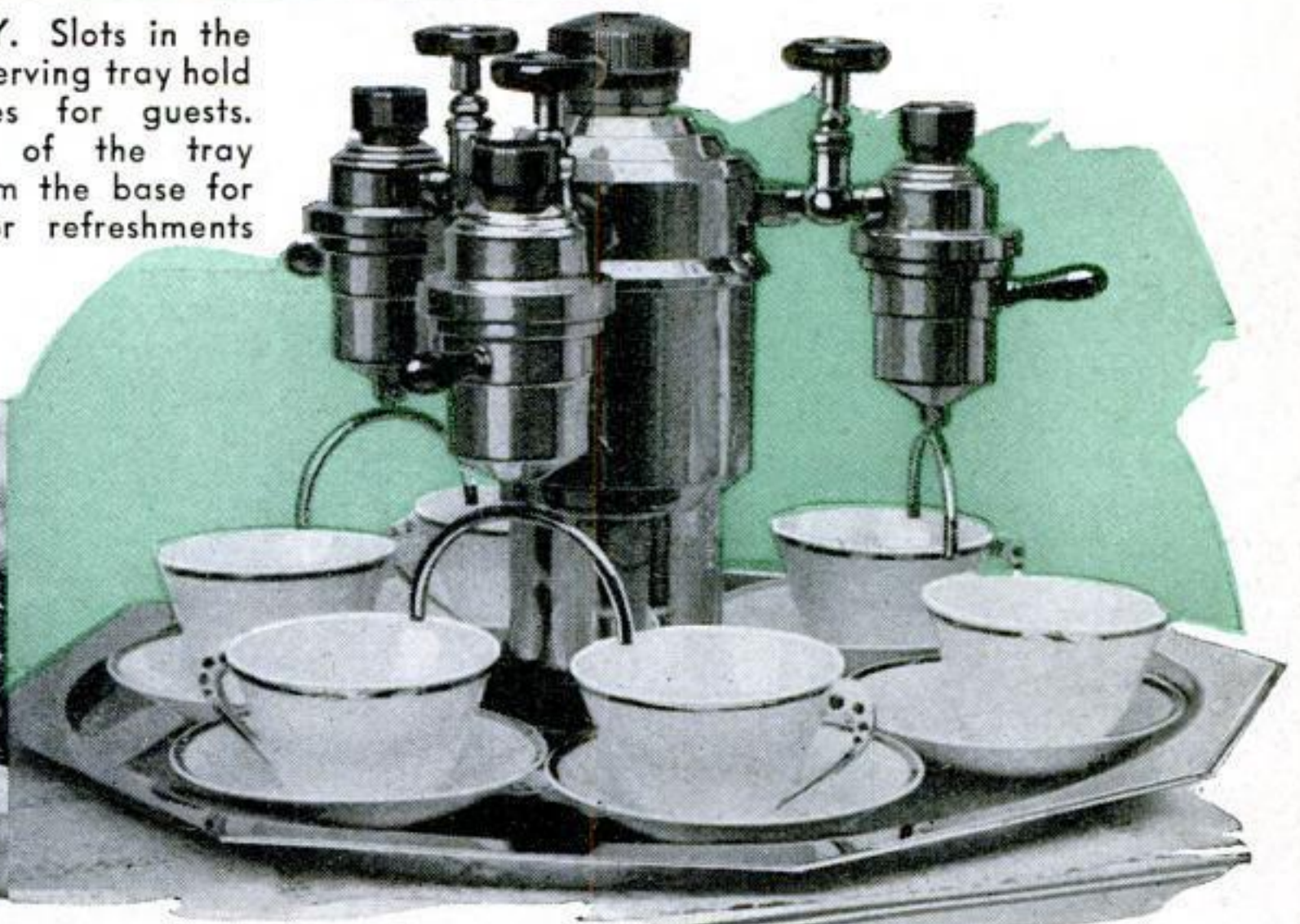
**DRIPLESS PITCHER.** By pressing a lever above the handle of a new pitcher, the user can cut off that last drop of milk or sirup



**BEVERAGE TRAY.** Slots in the rim of this novel serving tray hold twenty cigarettes for guests. The glass top of the tray is removable from the base for serving drinks or refreshments

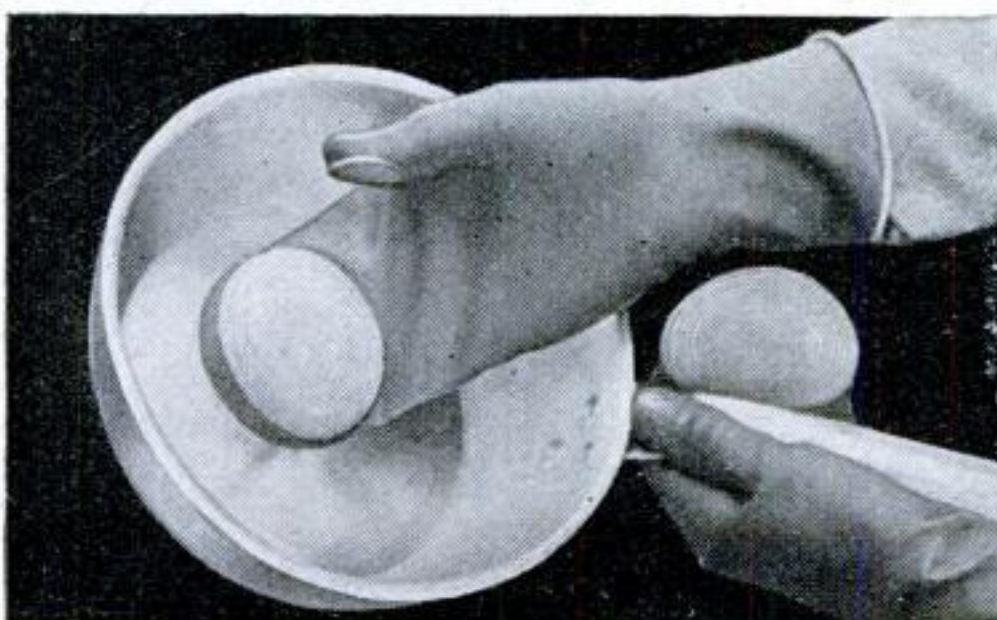
## COFFEE PERCOLATOR

Coffee is made in various degrees of strength, to suit individual taste, in the novel family percolator seen below. It has a capacity of six cups



## MITTENS HAVE SCOURING PADS

Abrasive pads vulcanized into the finger and thumb sections of the rubber mittens at the right are useful in washing dishes, scouring pots and pans, and other tasks about the home and garden





# Gus Settles a Family Quarrel

By  
MARTIN BUNN

IT WAS a warm, sunny May afternoon. In the little office of the Model Garage Joe Clark was busy over his ledgers. But outside, his chair tilted back against the wall beside the open office window, Gus Wilson sat idly smoking his pipe. His peaked black mechanic's cap lay on the ground beside him, and he was lazily enjoying the tickling sensation on his scalp caused by the languid breeze blowing gently through his close-cropped gray hair.

"What I'd like to do," he said through the window to his partner, "is go up to the lake and go fishing. And what I ought to do is get right back there in the shop and finish up that transmission job on the Kellys' old bus. Hey, Joe, you old fossil—don't you ever feel like doing anything except just working?"

A rubber stamp thudded dully on an inking pad and banged more sharply on the desk as Joe stamped "paid" on a bill, and his pen scratched as he wrote his initials and the date carefully under the stamp. "I'd a darned sight rather work here in comfort than sit in a boat all day with a million bugs biting me, the way you got me to do last summer," he answered at last. "But if you want to go fishing so bad, why the heck don't you take tomorrow off, and go? Things are sort of slow right now. I'll be around, of course, and Harry'll be able to take care of 'most any rush job that's likely to come in."

Gus laughed. "Bass season doesn't open for two weeks," he said. "I was just talking. But d'you know, Joe, you hit on just what's the matter with the garage business nowadays, when you said that Harry could take care of any job that's likely to come in. Sure he could—Harry or any other competent motor mechanic. That's the trouble—one repair job is getting to be too much like all the rest of them to suit me. What I'd like would be a good, old-fashioned brain-teaser—something that

would get my old bean to working full speed again. Yes, sir, that's what I need to wake me up!"

Joe grunted disdainfully. He knew the sort of job that his partner was wishing for—the sort of job that he could fool around with for the better part of a half day locating the trouble—and then charge the customer fifty cents because it took him only a couple of minutes to remedy it!

A shiny new roadster came rolling smoothly along the highway, slowed down, and then turned in at the garage. As Gus put down his pipe, pulled on his cap, and started for the gas pump, he saw that the car was driven by a middle-aged, pugnacious-looking little man who had a youngish and very stout woman sitting beside him. To his surprise, the driver didn't pull in at the gas pump, but drove right up to the office door, where he stopped and cut off his engine.

"This the Model Garage?" he demanded. "You Gus Wilson?"

"Right both times," Gus assured

him, grinning as he approached the car.

"My name's Snodgrass," snapped the little man. He gave a sideways jerk of his head toward his companion. "That's Mrs. Snodgrass." The stout woman smiled constrainedly. Gus noticed that her face was flushed and that the light of recent battle lingered in her blue eyes. "They tell me that you're a real trouble-shooter," went on the little man, "a regular J. Edgar Hoover when it comes to tracking down grief in a motor."

"Oh, I wouldn't say that," Gus began modestly. "But sometimes I'm able to—"

"All right!" interrupted Snodgrass. "Well, see if you can find out what's the matter with this car. The devil's in it—or in my wife. Open up the hood." Gus opened it. The little man turned the ignition switch and stepped on the starter. The engine purred as creamily as a radio crooner's voice. "What about that?" demanded the little man.

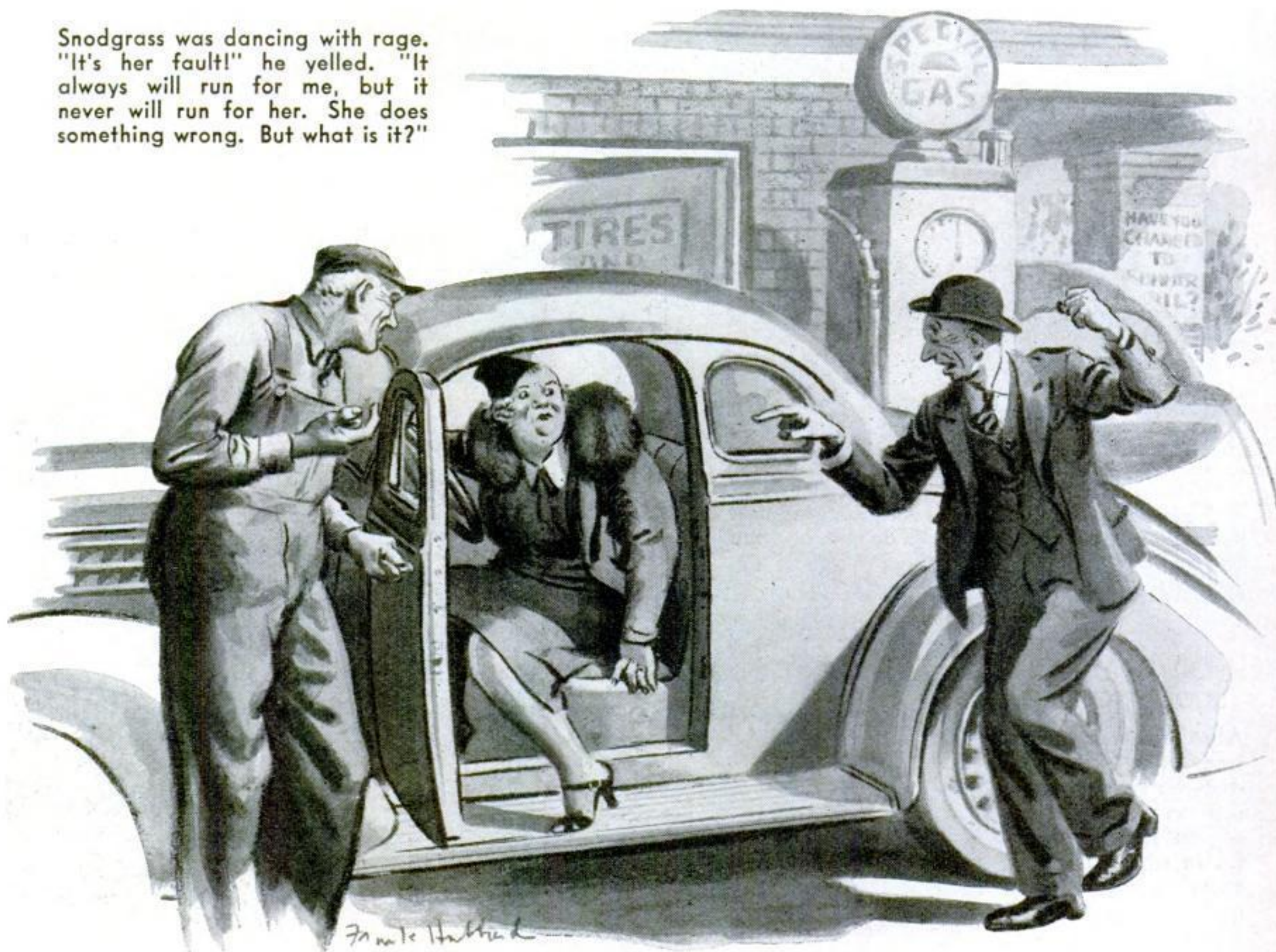
"What about what?" Gus asked. "There's nothing wrong with that engine—never heard one run more smoothly."

Snodgrass switched off the engine and hopped out of the car. "Now you do it!" he ordered his wife. Her face redder than ever, she moved over into the driver's seat, switched on the engine, and stepped on the starter. Nothing happened. She tried again and again, an expression of mingled amazement and disgust on her face.

Snodgrass was dancing with rage as he pointed an accusing forefinger at her. "It's her fault!" he yelled. "Just what I've been telling her. It always will run for me, but it never will run for her. She does something wrong. But what the devil is it?"

Gus opened *(Continued on page 126)*

Snodgrass was dancing with rage. "It's her fault!" he yelled. "It always will run for me, but it never will run for her. She does something wrong. But what is it?"







Broken bits of flagstone are laid in mortar around a tapered sheet-metal form 30 in. high

## Garden Lighthouse

FLASHES ON AND OFF AT NIGHT

**O**RNAMENTAL by day and doubly effective at night, this miniature lighthouse is an attractive garden feature.

The materials: A metal lantern of appropriate shape, without socket; three red girders from a toy construction set, or something else suitable for a guard rail; one small flame-shape electric bulb; one all-rubber pigtail socket; broken flagstones and Portland cement; one sheet of galvanized iron, 30 in. long by 20 in. at one end and 24 in. at the other; sufficient lead-covered cable to reach underground to the house lighting circuit, and a flasher plug.

The base is made from a flagstone about 2 in. thick, shaped with a cold chisel to form a rough circle about 20 in. in diameter. With a star drill, make a  $\frac{1}{2}$ -in. hole in the center.

The inner form is a sheet-metal column (open at both ends), 30 in. long with a diameter of 6 in. at the top and  $7\frac{1}{2}$  in. at the base. Overlap

the edges about  $\frac{3}{4}$  in. and rivet. Cut rectangular openings 4 by  $4\frac{1}{2}$  in. on opposite sides for windows. In the base, cut an arched opening about 5 in. high

and green panes may be installed. Pull the lead cable through the hole in the base and connect the wires to the socket.—ALAN BURTON.

for the lighthouse doorway.

Flagstones about 1 in. thick are broken into small pieces about  $1\frac{1}{2}$  in. wide and from 2 to 3 in. long. The mortar is three parts sharp sand and one part Portland cement, mixed rather dry. Set the form on the center of the base and, starting at one side of the doorway, lay a thin layer of cement right around the form. Set the stones in this and proceed in the same way to the top of the form. Small iron bars (nails with heads sawed off) may be set into the windows. Raking the cement from the cracks improves the appearance.

The top is cast from cement in a tin lid  $1\frac{1}{2}$  in. thick and 12 in. in diameter, and has a  $\frac{1}{2}$ -in. hole in the center. A piece of  $\frac{7}{8}$ -in. thick pine is set into the top to hold the socket, and its shape and size will depend on the opening in the bottom of the lantern. The socket should fit snugly into a hole in the center of the pine block. A flasher plug is screwed into the socket, and then the bulb is inserted.

The lantern may be picked up in most electrical shops where fixtures are made and assembled, and preferably it should be one in which red





## Colonial Charm and Utility Combined in an



Tip back the top, and the table is transformed into a comfortable high-backed Colonial settle. The seat lifts to reveal a storage box

# EASILY BUILT Hutch Table

By W. W. WHEATLY

The table forms an attractive piece for living room, game room, or sun porch



**T**HIS hutch table recommends itself to the modern mode of living because of its versatility. Few single pieces of furniture have so many uses, or look as well in their varied rôles. When it is used as a bench, the wing cleats give it the charm of a Colonial settle; and as a table, it will seat four persons comfortably. The commodious box or hutch is a convenient place to tuck away toys, magazines, or extra linen. When a drawing table is needed, the top may be tilted at an angle.

Either hardwood or a good quality softwood such as Douglas fir is suitable. When gluing up the top, drill dowel holes  $1\frac{1}{2}$  in. from either end and space the others  $11\frac{1}{2}$  in. apart. Saw out the top wing cleats and drill the holes as shown. With the top still in the bar clamps, hold the wing cleats in place with hand screws and fasten them to the top with screws.

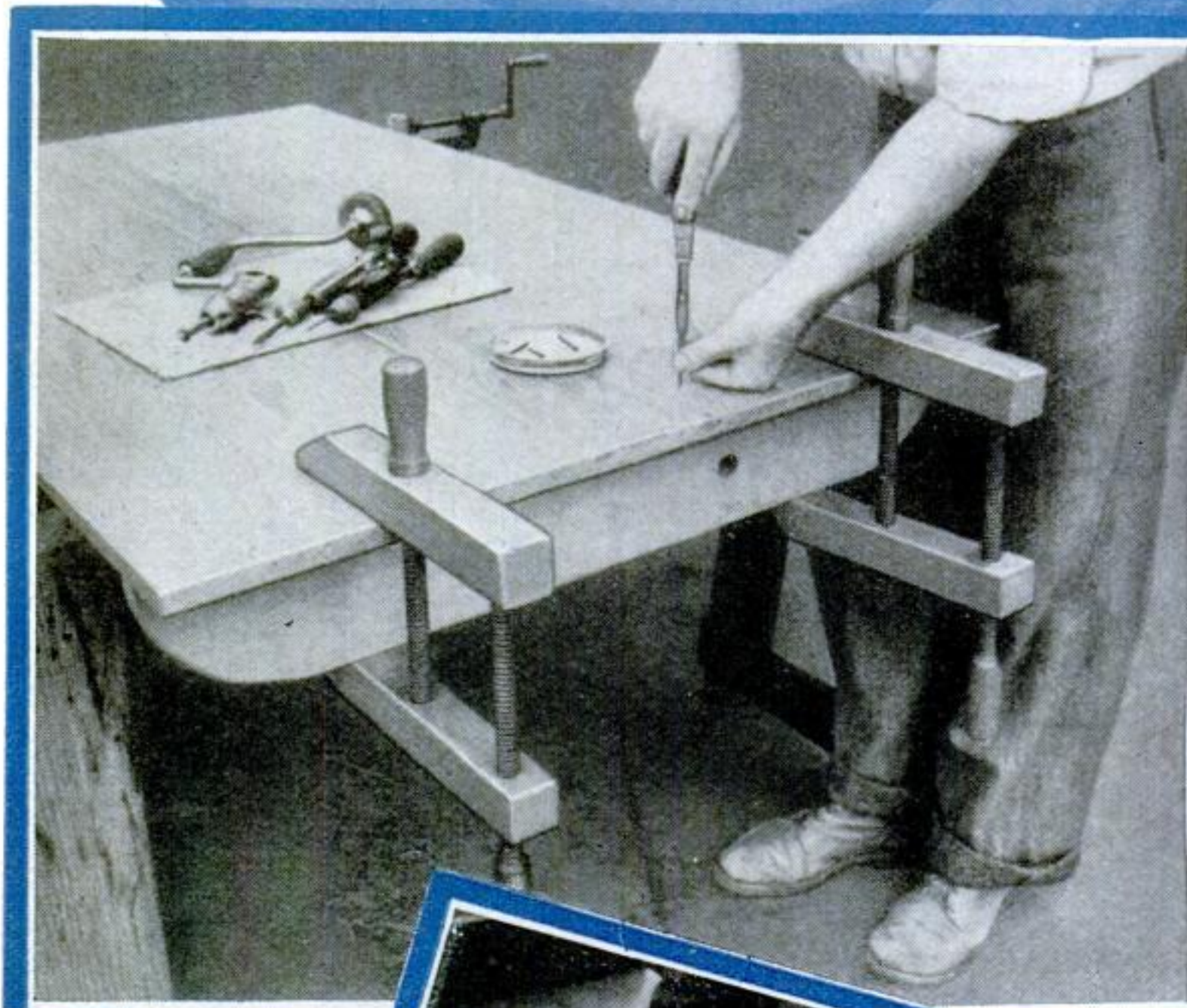
Run a slight bevel inside and outside the two edges of the butted joints of the end pieces to form a V. Screw the seat cleats and bottom cleats in place on the inside of the end pieces. Mark off the pattern at the top and bottom of the end pieces and saw out. Then saw the end cleats to the pattern, screw them in place on the end pieces, and bore the holes as shown through both cleats and end pieces.

Screw the bottom cleats on the inside of the front and back panels, and fasten the panels to the end pieces by screwing them up to the cleats and with screws through the end pieces into the panels. Put in the bottom boards and fasten with  $\frac{3}{4}$ -in. brads. Screw the back band (hinge strip) in place, and fasten the hinges to it and to the box cover, thus finishing the seat.

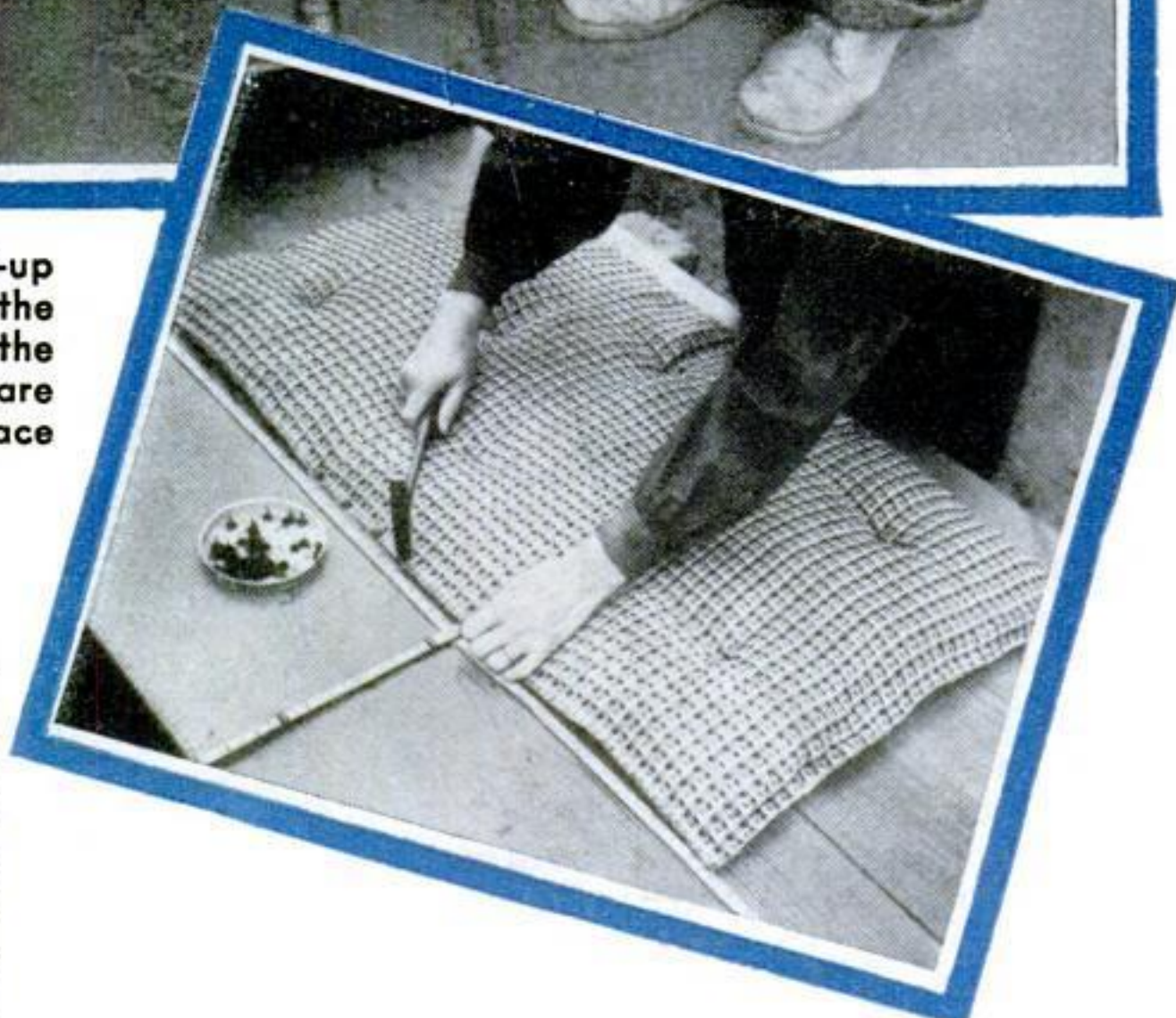
Add the final touches by applying an oil stain of suitable color and a simple rubbed-wax finish to all the woodwork, not forgetting the underside of the table top.

Making the seat cushion and back pad is a job of simple sewing. The first and most important requirement is to finish all seams on one side before beginning those on the other side.

The boxed cushion cover is made with French seams, which show on the outside like a welt. To make a French seam, cut the upholstery fabric in pieces the size specified, baste all the right faces together and stitch, but leave one end seam open for



While the glued-up top is still in the bar clamps, the wing cleats are screwed in place



The pad is attached to the seat back with fancy tacks. A tape measure and rule are used to make certain it is properly placed

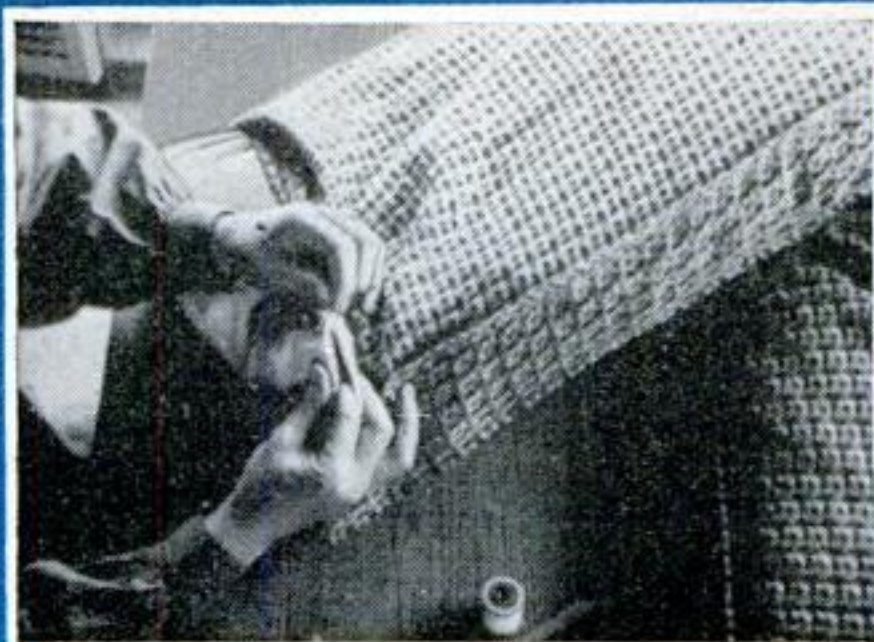


## LIST OF MATERIALS

No. Pc.	Description	T.	W.	L.
4	Ends*	$\frac{3}{4}$	8	$26\frac{1}{4}$
2	End cleats*	$\frac{3}{4}$	$5\frac{3}{4}$	16
2	Seat cleats	$\frac{3}{4}$	2	$14\frac{1}{2}$
2	Bottom end cleats	$\frac{3}{4}$	1	$14\frac{1}{2}$
2	Bottom panel cleats	$\frac{3}{4}$	1	48
2	Bottom boards	$\frac{1}{2}$	$7\frac{1}{4}$	$49\frac{1}{2}$
1	Seat back band (hinge strip)	$\frac{3}{4}$	3	$49\frac{1}{2}$
1	Seat (hinged box cover)	$\frac{3}{4}$	$13\frac{3}{4}$	$49\frac{1}{4}$
2	Front and back panels	$\frac{3}{4}$	$8\frac{1}{2}$	$49\frac{1}{2}$
2	Table top	1	14	60
1	Table top	1	8	60
12	Hardwood dowels for top	$\frac{3}{8}$		3
2	Top wing cleats	1	6	36
4	Hardwood dowel hinge pins*	$15/16$		$4\frac{1}{2}$

NOTE: All dimensions are given in inches and are finished sizes. For parts marked with an asterisk (\*), see detail or pattern.

Screws: 42—2-in. No. 7 and 48— $1\frac{1}{2}$ -in. No. 6 flathead bright wood screws. Hinges: 1 pr. 3-in. tight-pin butts with 1-in. screws. 1 box round-head upholsterer's tacks. Upholstery fabric: 2 pc. 17 by 50 in.; 2 pc. 4 by 50 in.; 2 pc. 4 by 17 in.; 1 pc. 24 by 40 in. Muslin: 1 pc. 24 by 40 in.; 1 pc. 38 by 50 in. Batting: 1 light wool "bat." 5 lb. kapok or silk floss.



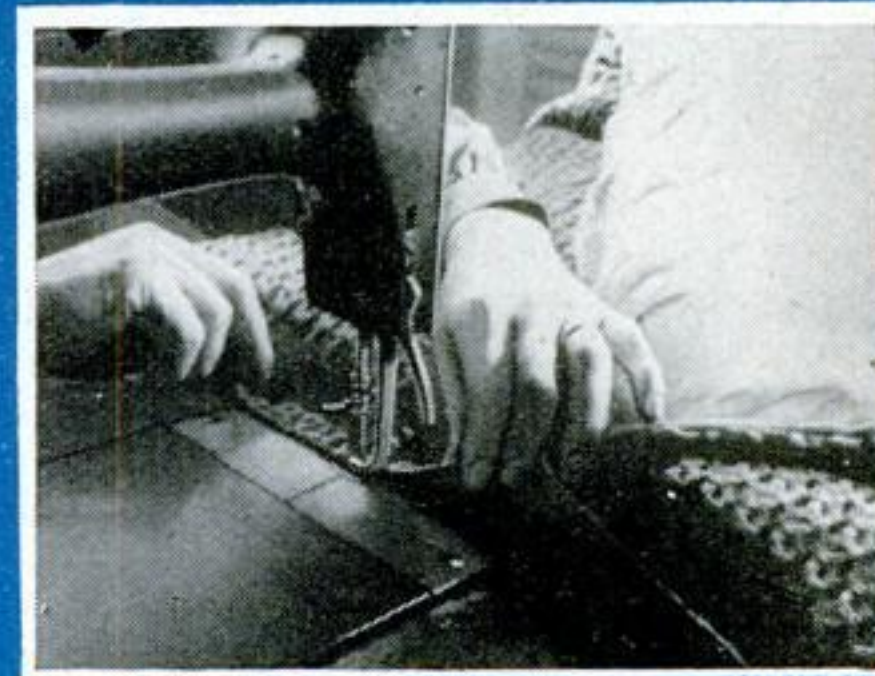
Fitting the cushion to the boxed cover by tucking in the corners and then catching the corner in place with needle and thread



When the cover opening is closed, tape is stitched along the seams to reinforce the rather loosely woven upholstery material



Doubled button thread is sewn through the back pad and then tied at the back



When the upholstery fabric, the wool "bat," and the muslin for the seat pad are together, the edges are stitched by machine



inserting the cushion. Next, press with damp cloth, turn and baste the seams on the right side, and stitch. Press again. The boxed cover is now ready for the cushion.

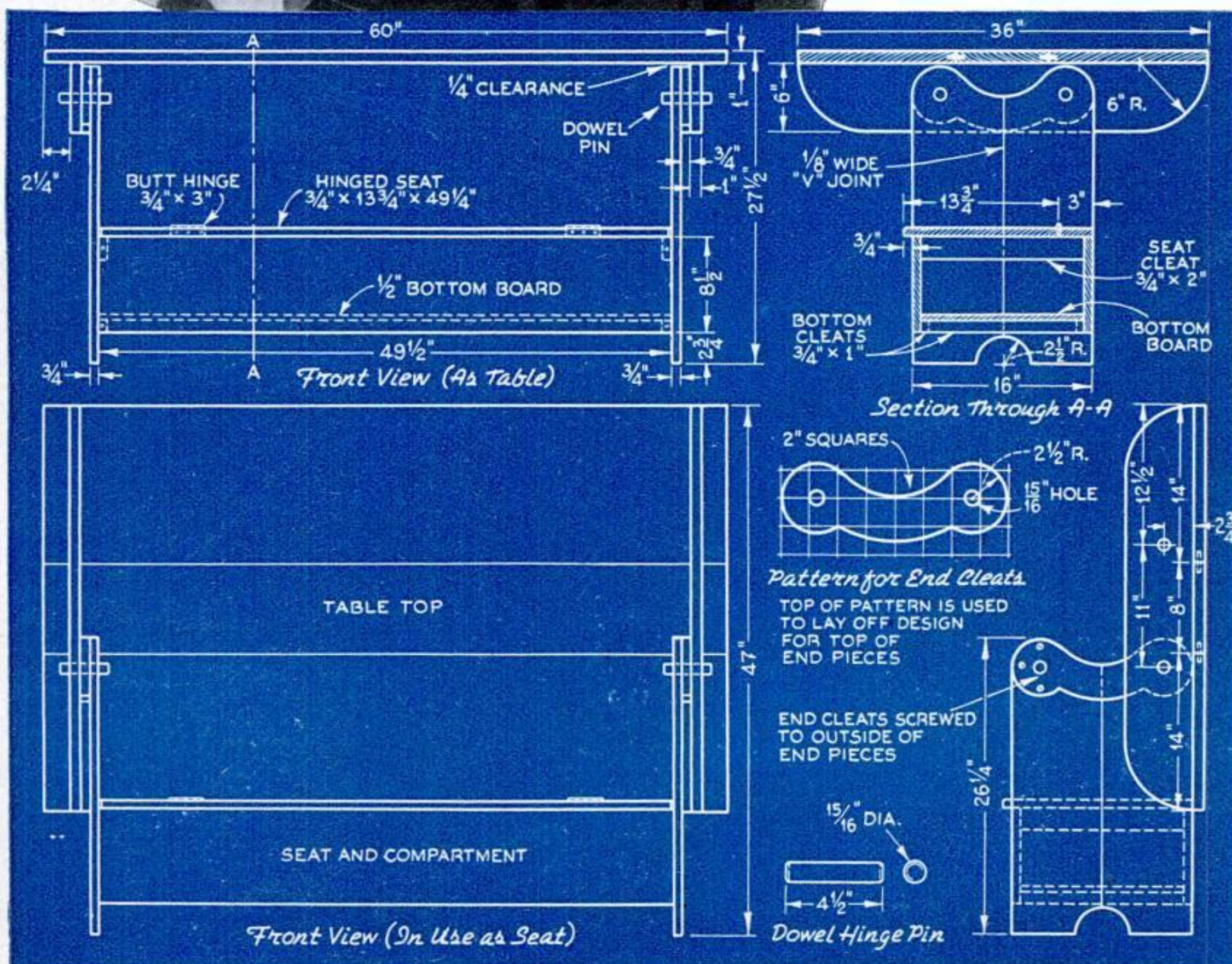
To make the cushion, sew up the length of muslin or ticking, fill with kapok or silk floss, close the opening left for stuffing, and finish the squared corners as illustrated. Insert in the cover, and finish.

For the back pad, cut (do not fold) the wool "bat" in

pieces slightly smaller than the muslin backing, place one atop the other, and baste together with long stitches, using an upholsterer's needle and heavy thread. Place the wool batting on the muslin back so that it is even all around, and carefully cover with the upholstery material. Finish as shown.

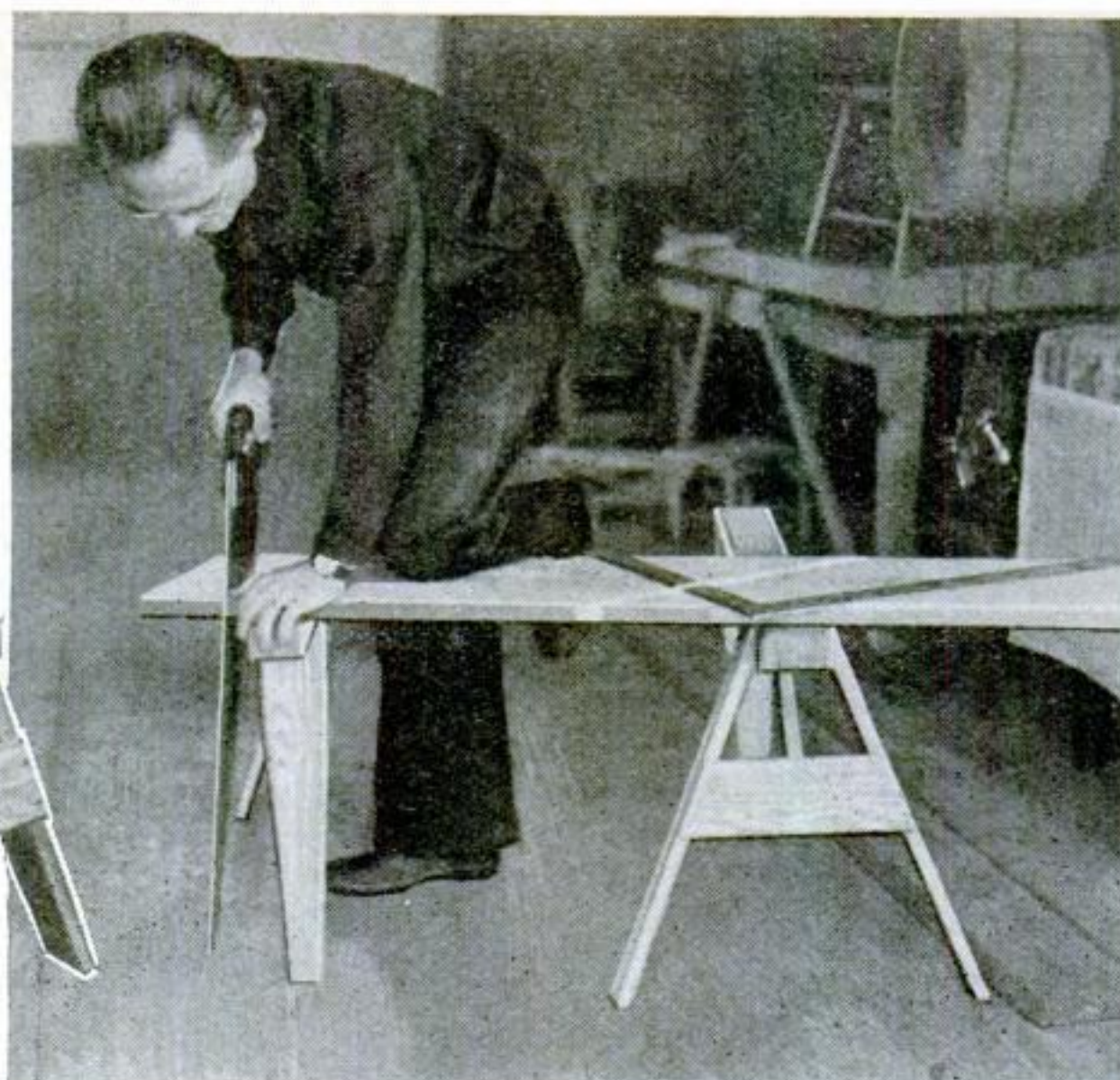
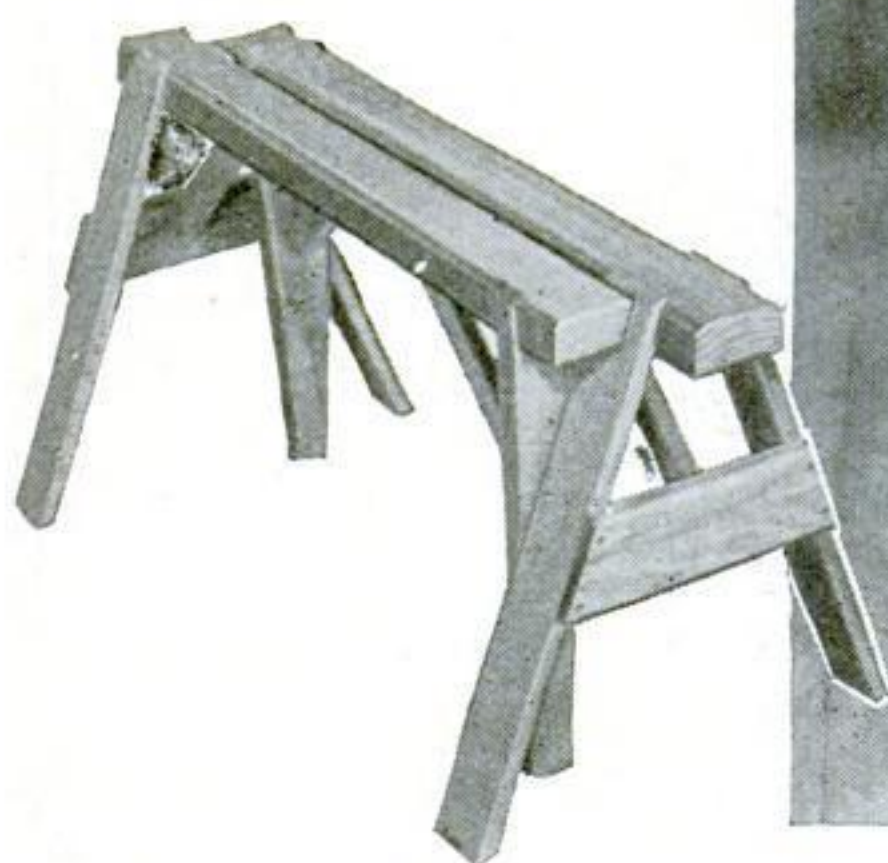
When applying this pad to the seat back, it is placed 10 in. down from the top of the seat back and at equal distances from either end. Use a tape measure for placing the tacks on 2-in. centers, and a rule for keeping the pad straight with the top of the seat back. Begin at the top center and work to either end; next tack along the bottom, being careful to keep the pad snugly against the wood. Finish by tacking along the ends.

Working drawings of the hutch table. Note that the top may be tilted whenever necessary to serve as a drafting board





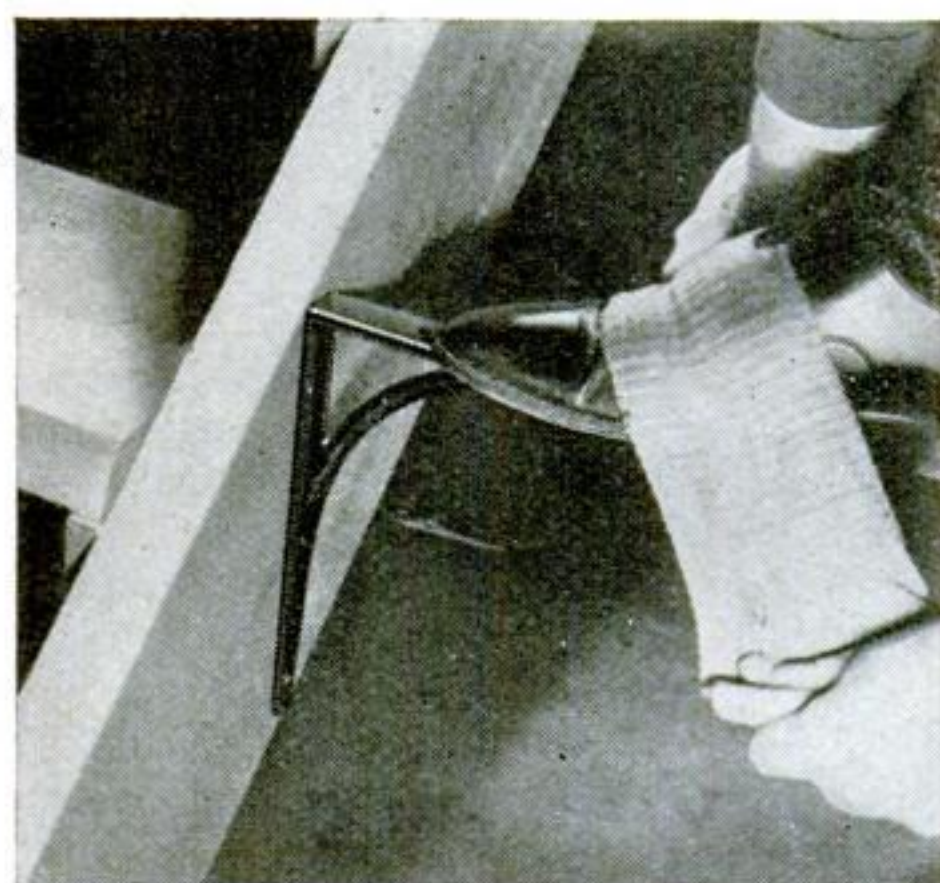
Two horses take little more space than one when not in use. Right, a board can be sawed close to the support without danger of cutting into the leg



## Sawhorses with Three Legs NEST TOGETHER COMPACTLY

THREE-LEGGED sawhorses constructed as shown above have the advantage of nesting closely together so they can be stored in a small space. In addition, sawing can be done close to the horizontal support at the end where there is only one leg without any danger of cutting into that leg. A third feature lies in the fact that the three legs will rest solidly on any surface.

The double legs are made in the usual way, with a crosspiece to strengthen them and a brace from the top down to the crosspiece. The single leg is notched so that the horizontal piece can be set into it. This makes a joint that will stand up under heavy weights and hammering. All parts should be of oak or other hardwood, fastened with screws.—BROOKS HILL.



## Shoe-Shining Bracket

INSTEAD of using the cellar stair treads, a kitchen chair, the porch railing, or some other unhandy place for shining your shoes, make a permanent stand from a heavy iron shelf bracket. Fasten it to the stringer of the cellar stairs or in some other out-of-the-way place where no one will bump into it. Use heavy 1 $\frac{3}{4}$ -in. wood screws.

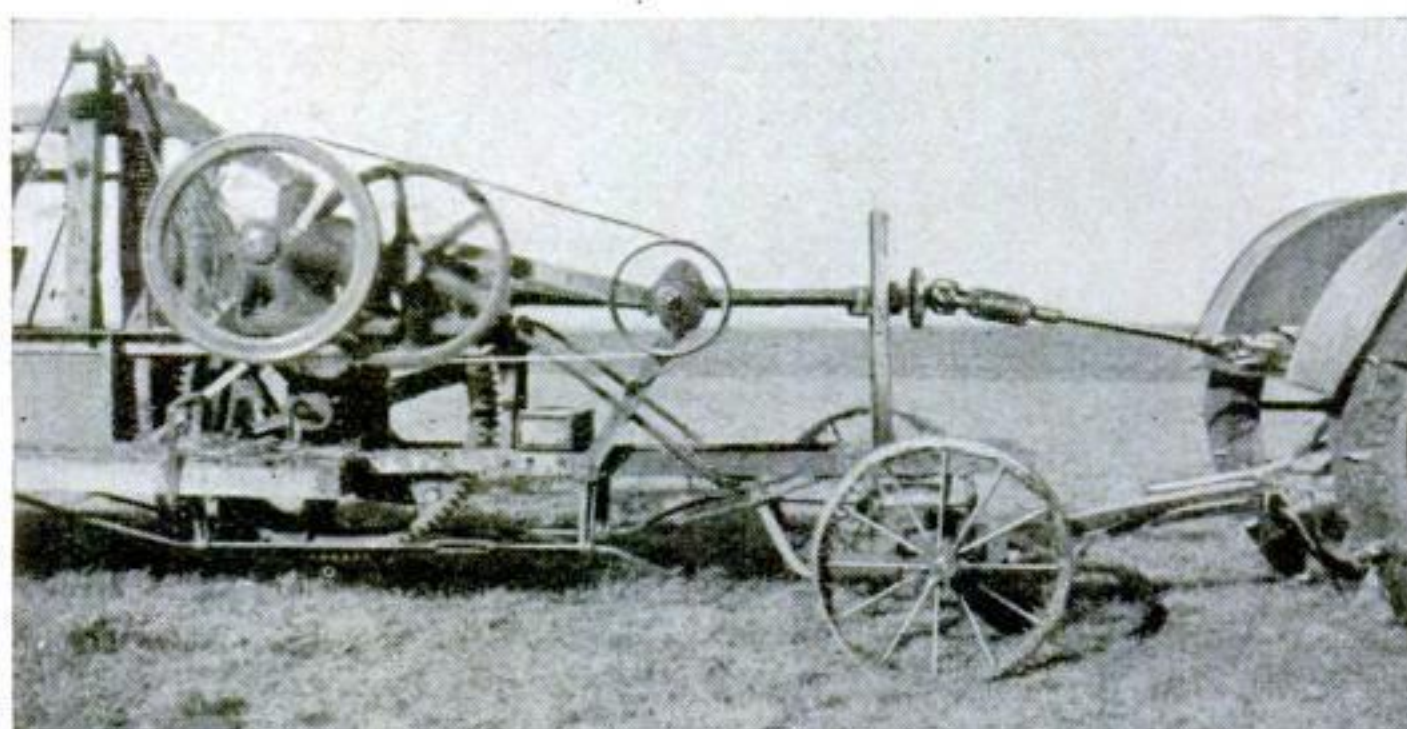
## Old Axle Used as Power Take-off Drive

STATIONARY machines may be inexpensively equipped to be operated by the power take-offs of tractors by use of discarded auto parts.

The belt-power stationary baler illustrated, for example, has been changed into a power take-off drive by use of an old auto axle. The differential was

locked by welding, the torque tube and shaft were cut off, a pulley fitted, and the belt applied. The baler may now be operated as it is drawn through the field or while stationary at the barn or stack without any lost time in "lining up" and backing into the belt. The baler may also be operated in a more limited space than was before possible and can be moved instantly whenever necessary.

This drive may be adapted to other stationary machines with equally advantageous results.—STANLEY RUSSELL.

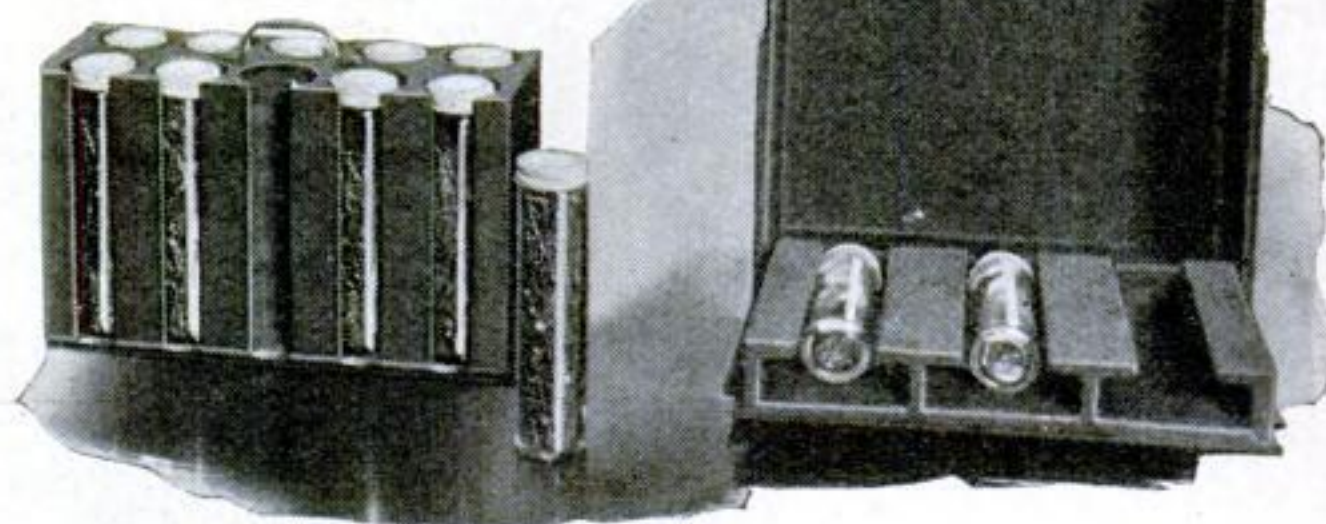


A belt-power stationary baler operated by the power take-off of a tractor by means of a drive made from an old auto axle

## Old Poker-Chip Rack Holds Hardware

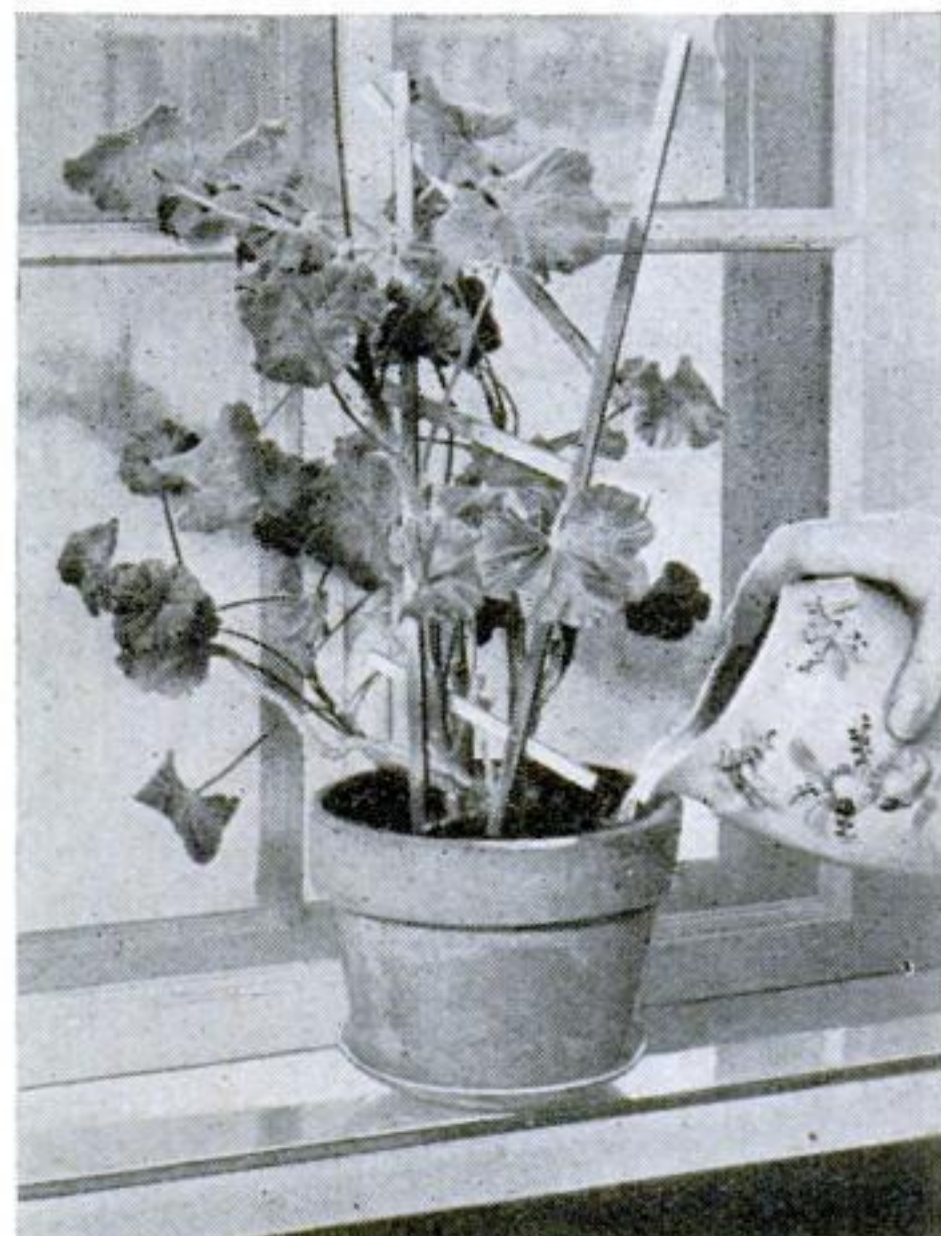
AMATEUR craftsmen and model makers should be on the alert to obtain neat, convenient containers for small nails, screws, and other hardware. Various discarded articles intended for other purposes can be pressed into this service, as, for example, an unused

poker-chip rack. Bottles to fit whatever type of holder you get can usually be purchased at a drug store, where bottles of many heights and diameters are available.—C. H.



## Window Sills Protected with Plate Glass

WHEN flowerpots are placed on inside window sills, or window stools as they are called by carpenters, the finish often becomes badly marked because of spilled water. Pieces of salvaged plate glass, cut to fit the sill and used as shown below, give perfect protection and look well.—R. O. L.

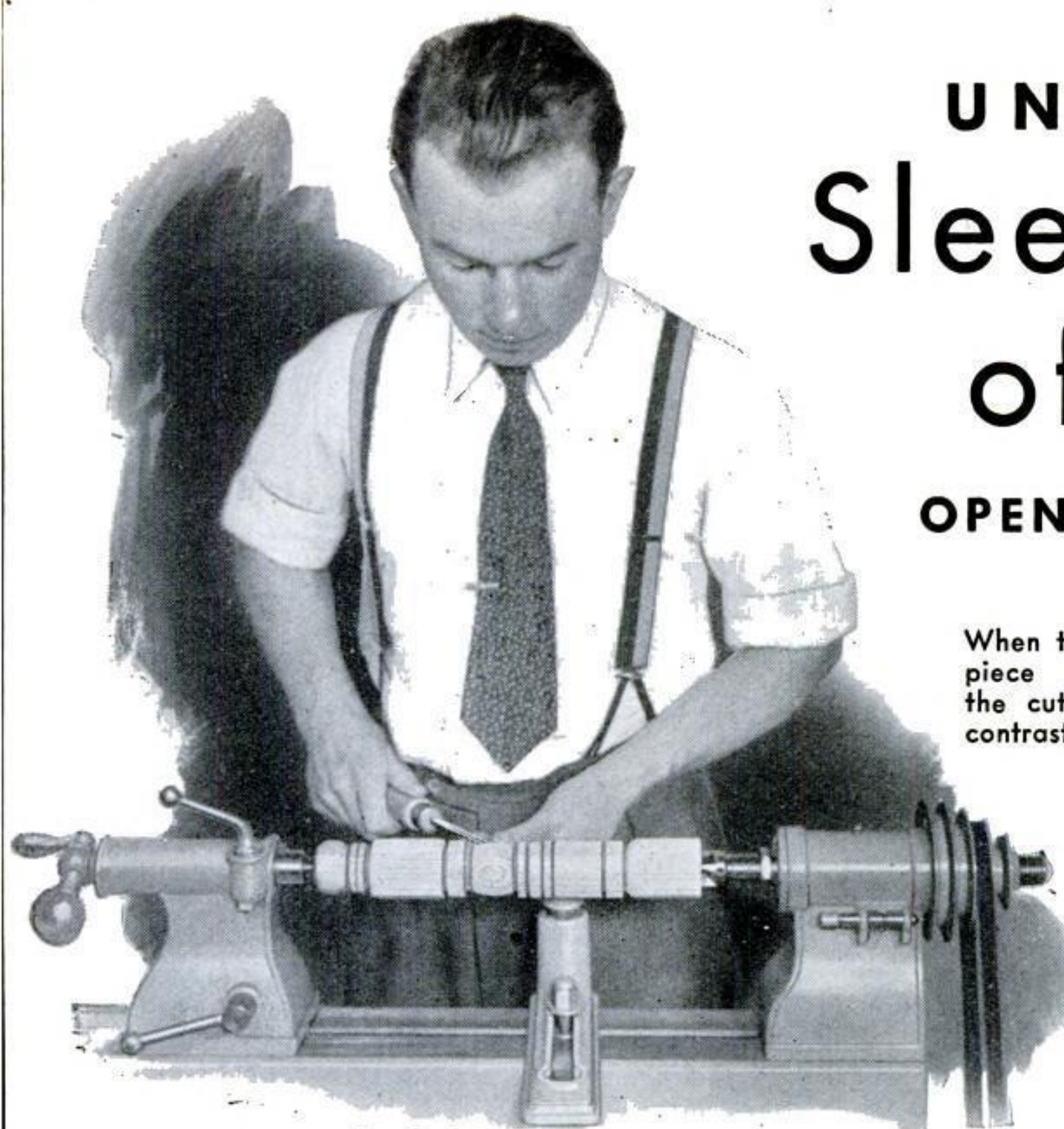


A piece of scrap plate glass is cut to fit the window sill. This protects the finish

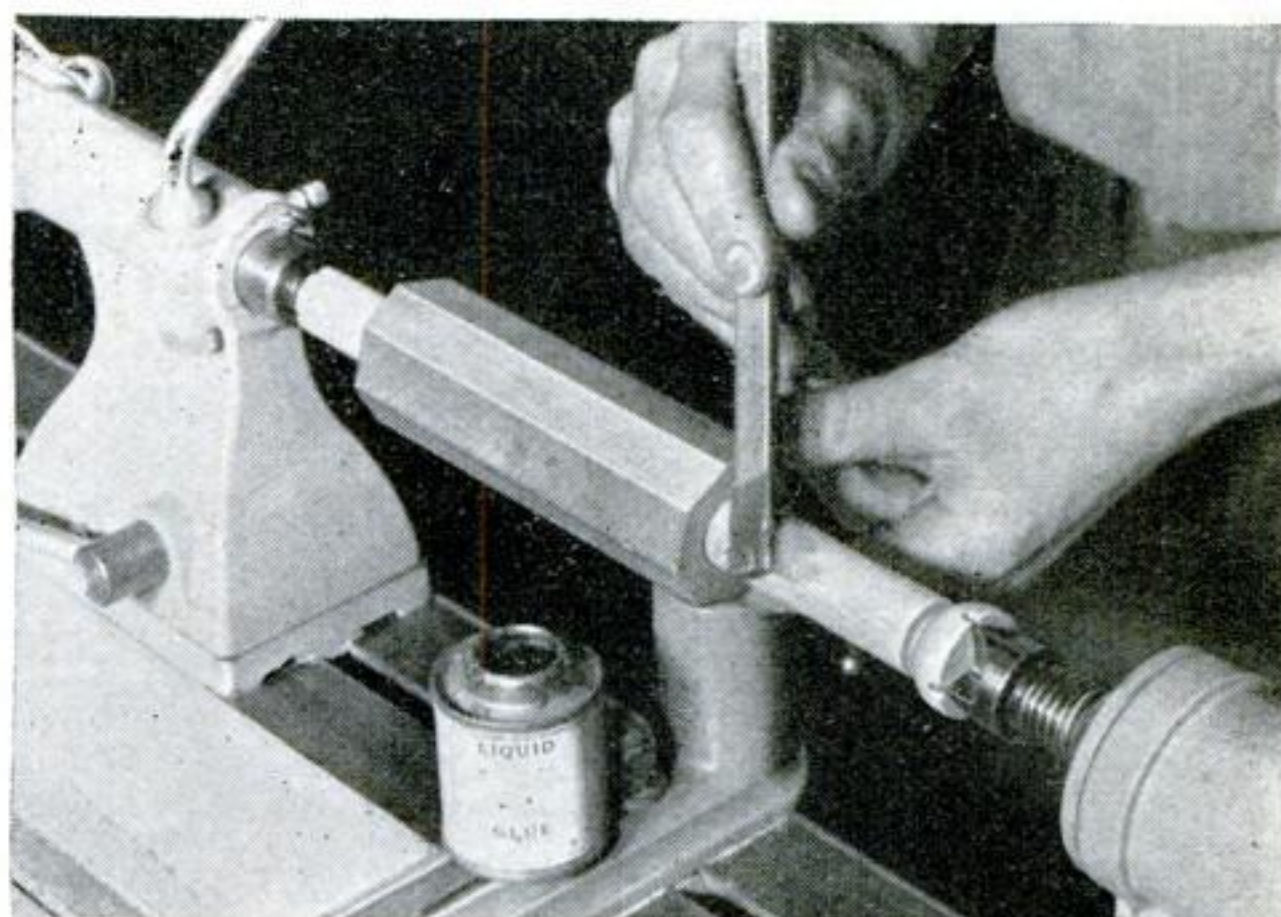


# UNIQUE Sleeve Method of Wood Turning

OPENS NEW FIELD FOR CRAFTSMEN



When the built-up piece is turned, the cuts reveal a contrasting wood



By HOWARD R. HEYDORF

**W**OODS of different colors may be combined by gluing pieces in various ways, but one of the most novel methods for building up the stock is shown in the accompanying illustrations. It is simple enough so that even the beginner will encounter no great difficulty in producing excellent work.

All that is necessary is to glue several wooden sleeves of graduated size, each over the next smaller one, to form a cylinder from which the article is finally turned to its finished shape. As one layer is cut through, the next one reveals a different wood, so the artistic possibilities are unlimited.

The cylinder is assembled upon a wooden centerpiece, which should preferably be made from one of the stronger woods. This is turned to the same size for its entire length. The cutting tool is best clamped between two blocks of wood, which are fastened together with bolts and wing nuts. If the tool rest is adjusted parallel with the work and the tool and the blocks are moved along it, a perfect cylinder can be formed.

The block from which the first sleeve is to be formed is drilled through its center for its entire length. The centerpiece is finish turned and then sanded till the drilled block will slip onto it easily but not loosely. Sanding of this type is best accomplished by folding a full-length sheet of sandpaper around a long, straight block of wood. This will remove any unevenness.

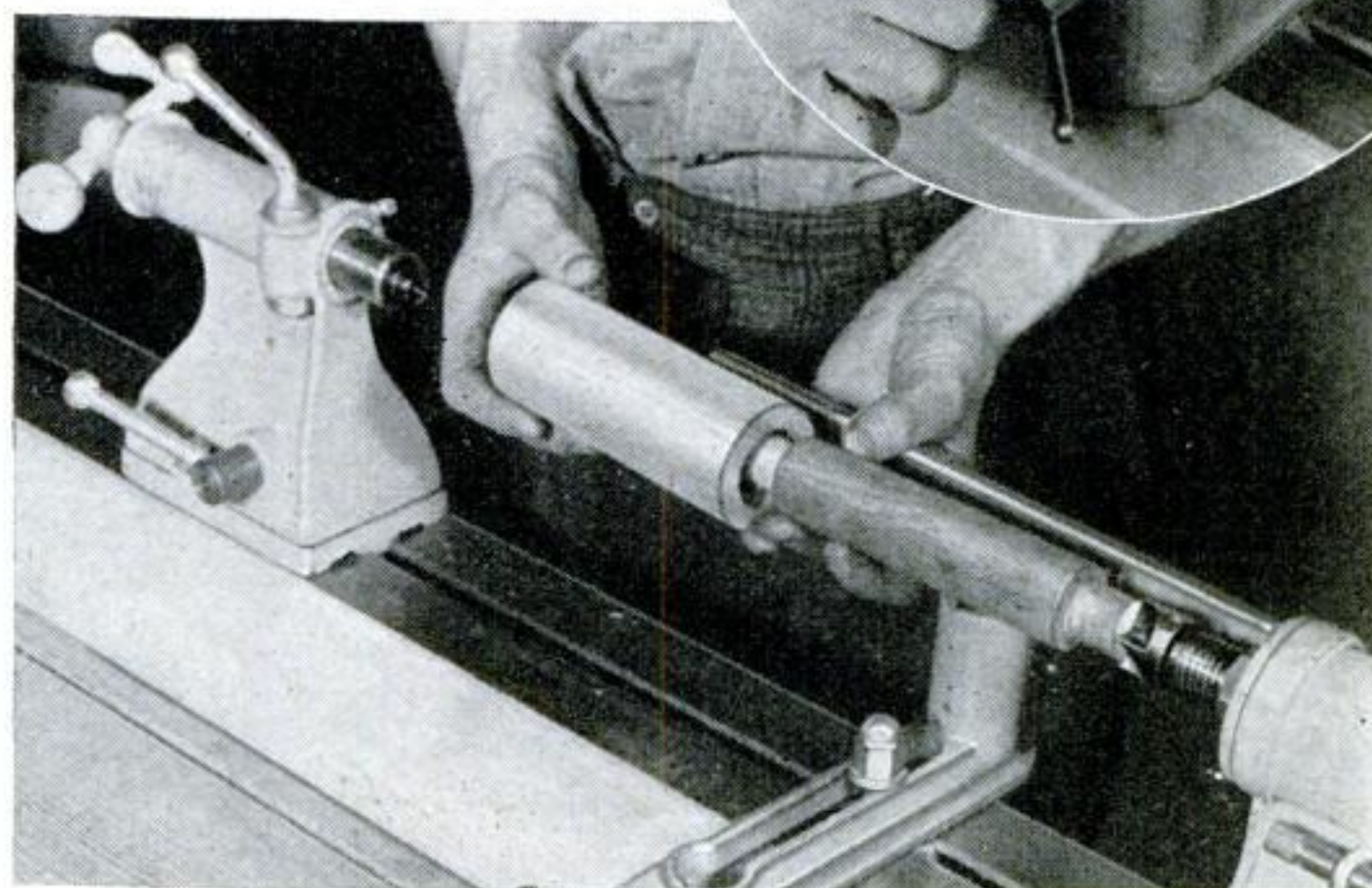
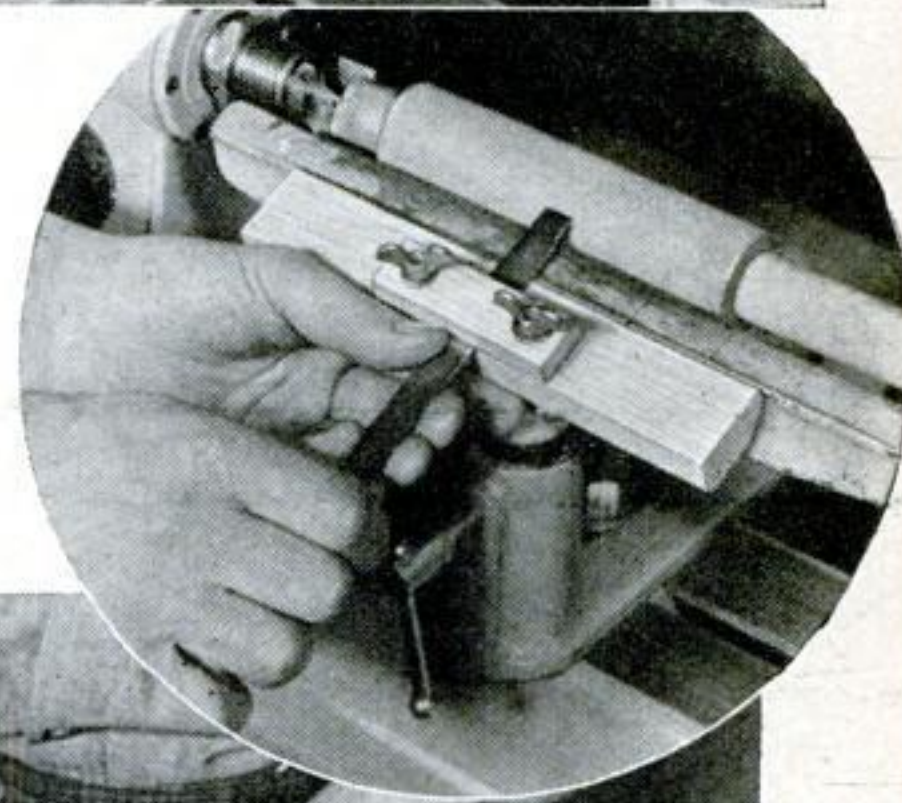
Now the first (*Continued on page 97*).



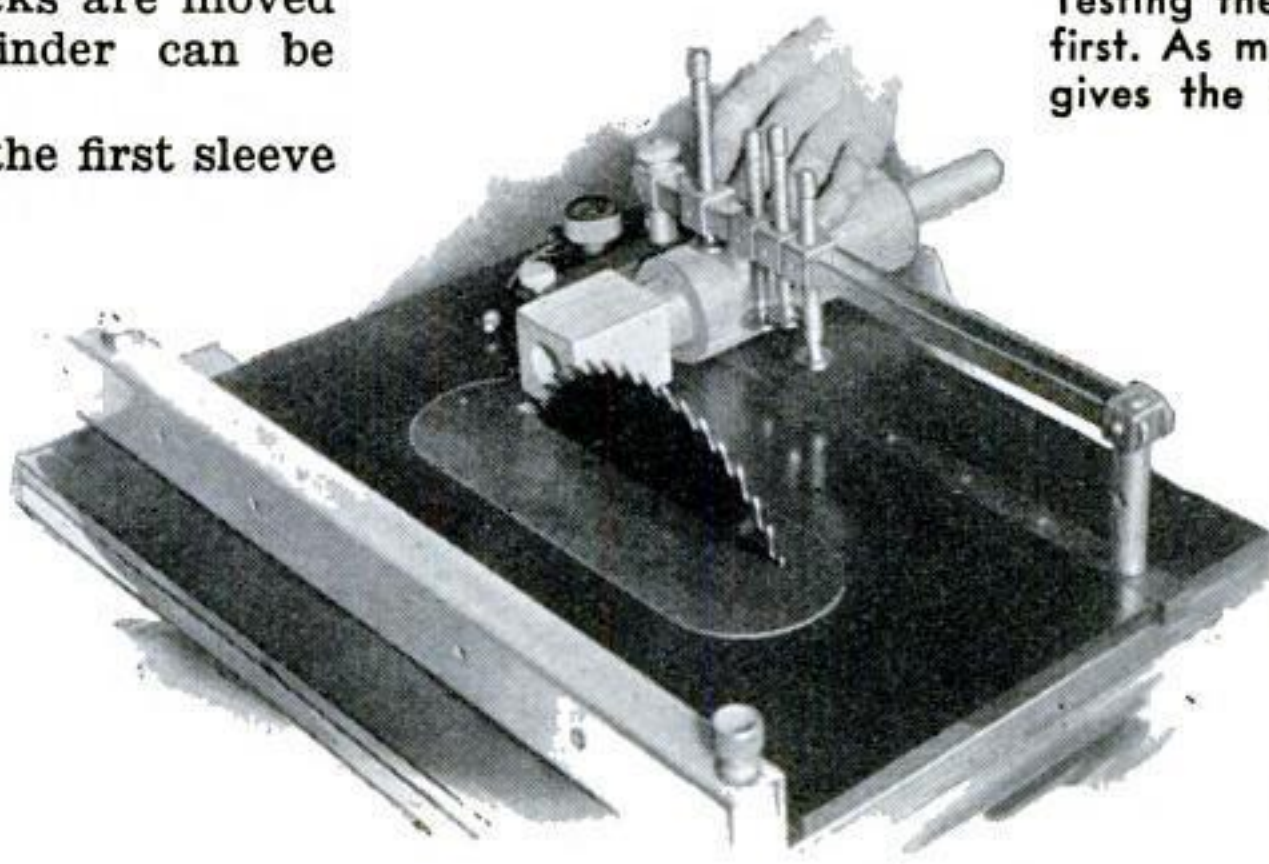
The finished turning for a furniture bench

Gluing one of the sleeve blocks to the core, which has been turned to a cylinder that fits the hole

To insure a true cylinder, the tool is held between two strips of wood, which slide along the tool rest

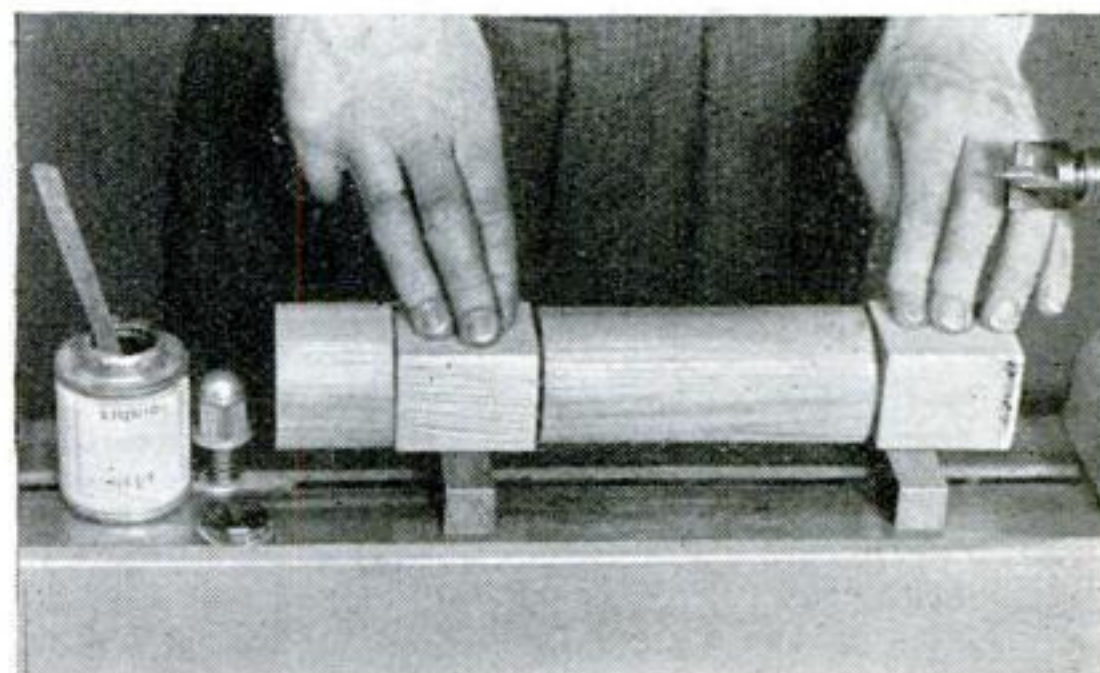


Testing the fit of a second sleeve to be glued on the first. As many sleeves may be added as needed. This gives the finished piece the effect of being inlaid



After each rail block has been drilled, it is slipped over the end of the core and trimmed square on the saw. This square end is a guide for the other cuts

In the case of the small bench leg, two squared-up blocks are glued on as shown below, and are adjusted by resting them on strips of wood on a true surface



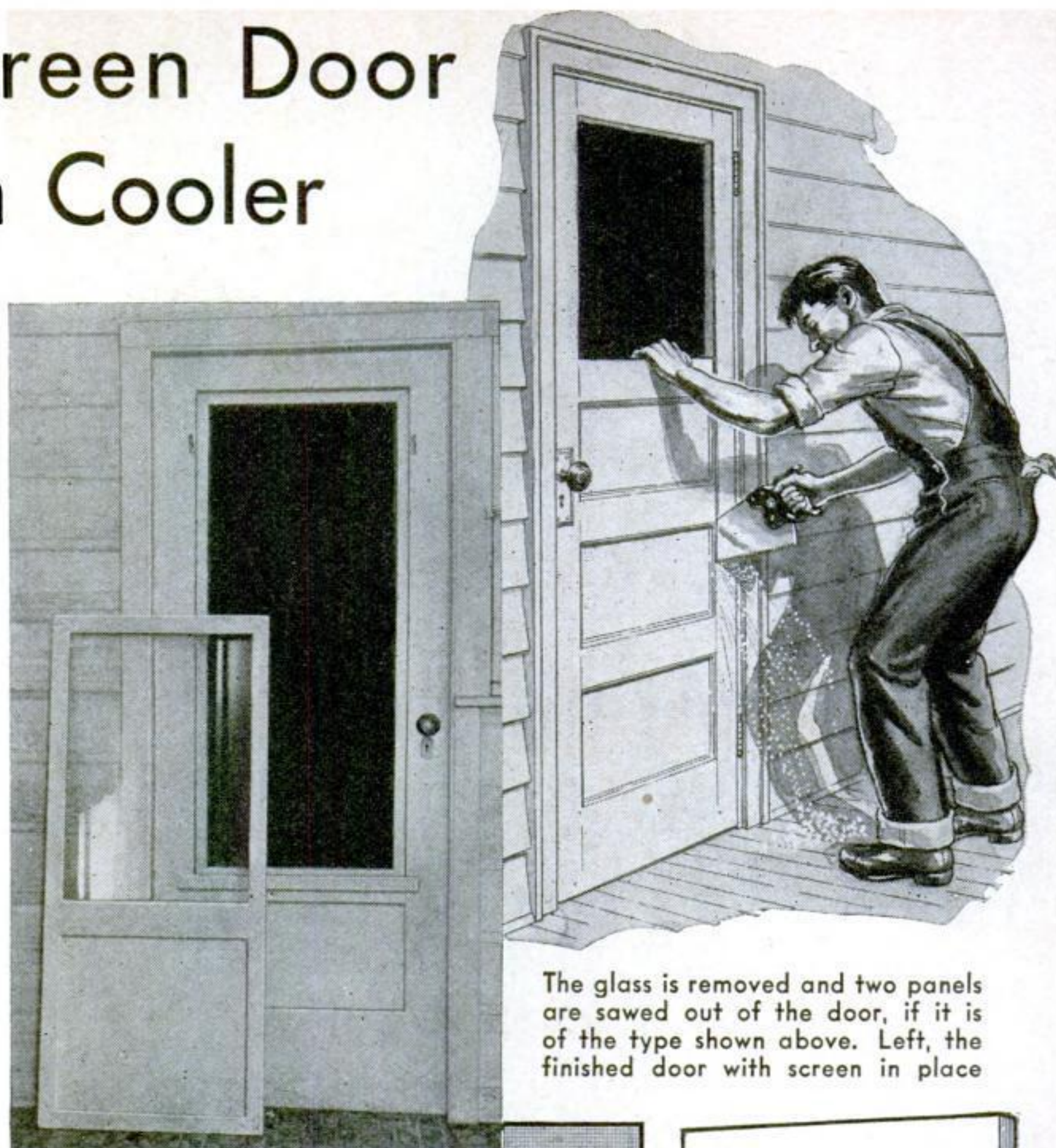


# Combination Screen Door Keeps Kitchen Cooler

IN THE warmer sections of the country where a screen door is all that is required at the kitchen entrance from early spring to late fall, it is a simple matter to alter an ordinary kitchen door of the type illustrated so that it becomes, in effect, a screen door during the summer and a regular door during the winter. If greater security from intrusion is required when no one is at home, the glass panel can be used on the inside and fastened with catches or small door bolts.

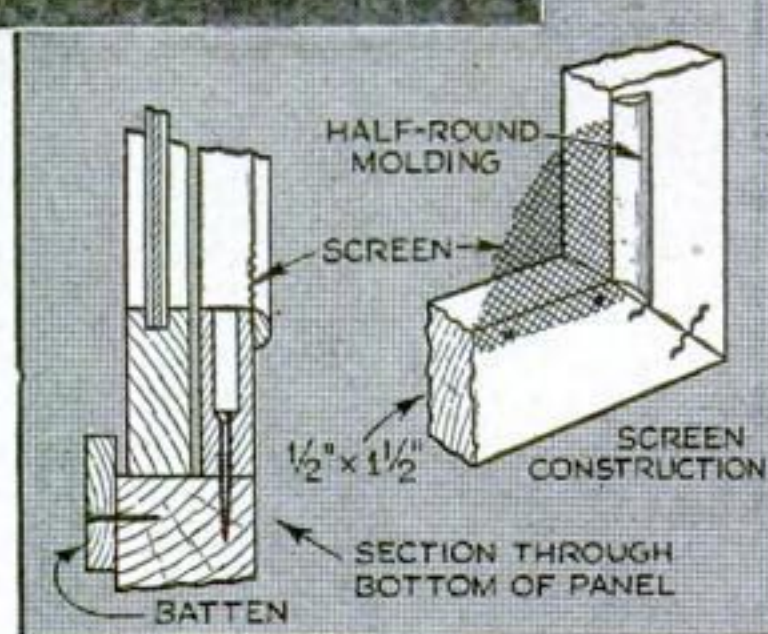
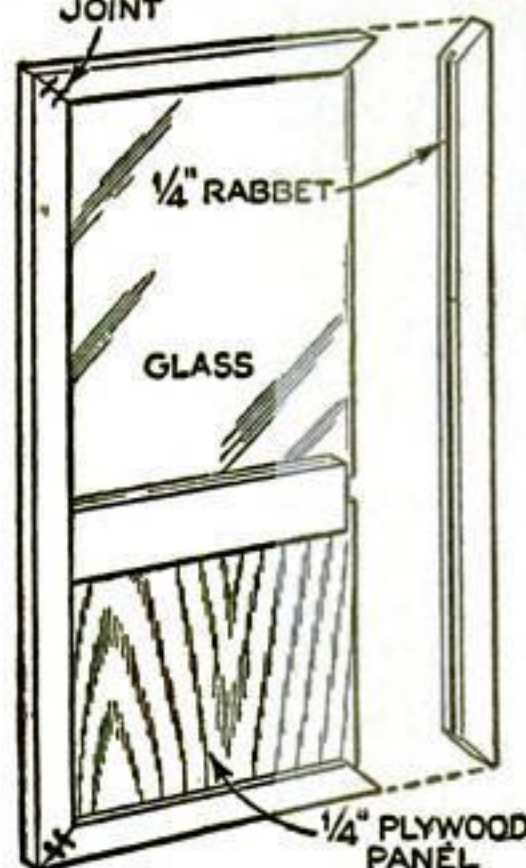
Remove the glass and saw down through two panels as shown; then smooth the edges of the opening with plane and sandpaper. Construct a screen frame of light material in any way desired. Perhaps the quickest and simplest way is to miter the corners and join them with corrugated fasteners. If fasteners are used, be sure the frame is laid on a perfectly flat surface, such as a clean garage floor or driveway, when driving them home. After the screen wire has been tacked on, the frame is secured in the opening with countersunk screws.

The screen is left permanently in place, and a removable storm panel is made for use in the winter or during wind and rain storms. The outside members of this frame are  $\frac{3}{4}$  by  $1\frac{1}{2}$  in., but it is better to have the center rail somewhat wider. The parts are rabbeted  $\frac{1}{4}$  in. deep for the plywood panel and the pane of glass, and the latter is puttied in tightly after being set in the rabbet. This frame is held at the bottom by a batten and at the top with two door buttons.—HI SIBLEY.

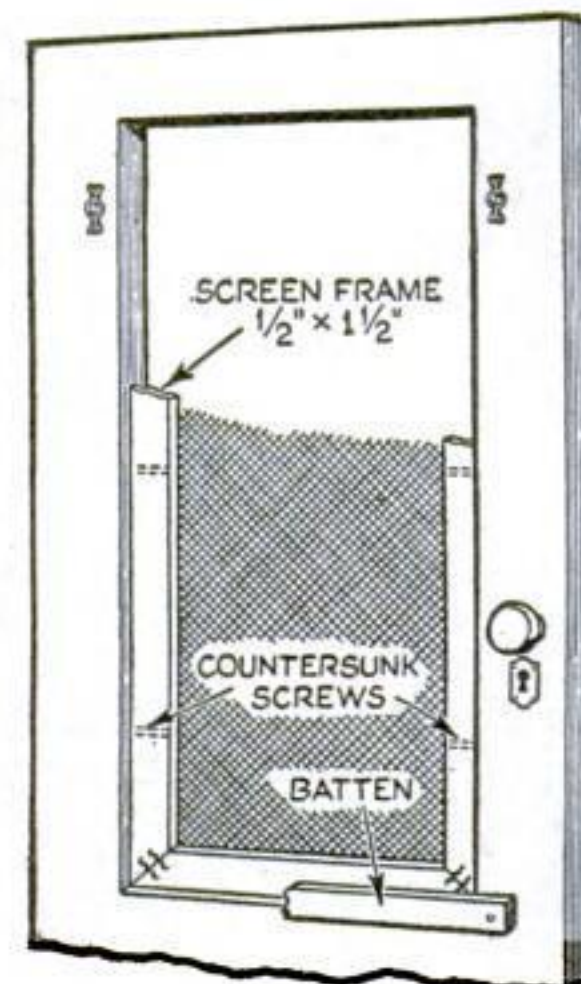


The glass is removed and two panels are sawed out of the door, if it is of the type shown above. Left, the finished door with screen in place

CORRUGATED  
FASTENERS  
HOLD MITER  
JOINT



The glass frame is made as at the left, the screen as at the right. Above, section showing frames in place and detail of the screen



## Blackboard Behind Bench Used for Shop Sketches

ON THE wall of my shop, directly behind my bench lathe, I have a 4-ft. square piece of wall board, painted with blackboard paint. On this I can quickly chalk a rough design, note important measurements, or attach drawings with thumb tacks.—M. L. FULLER.



The lower portion of the distributor cap may be partly filled with plaster to add weight. At right, how the pencils are held



## Handy Desk Pencil Holder and Paper Weight Made from Old Auto Distributor Cap

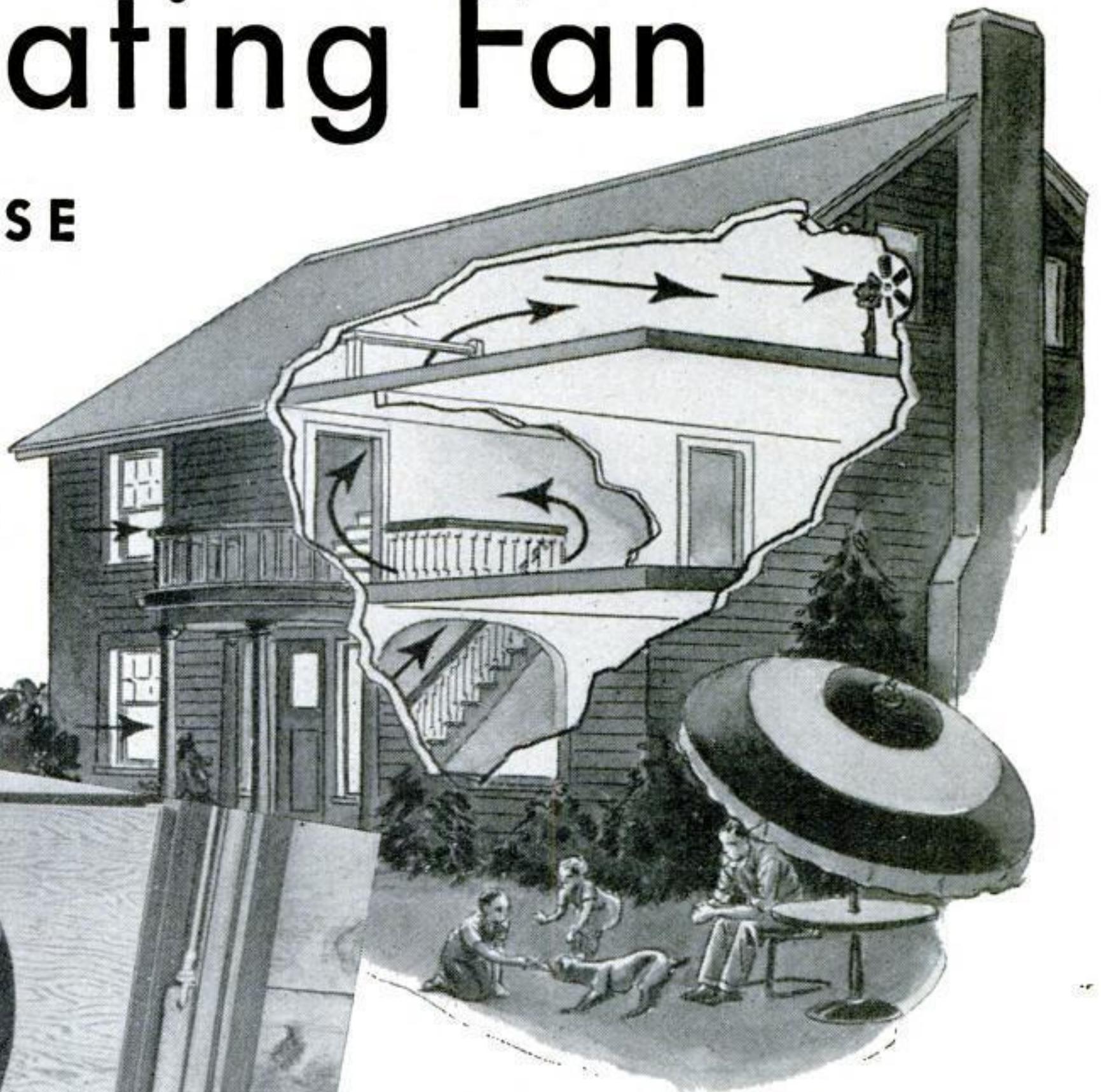
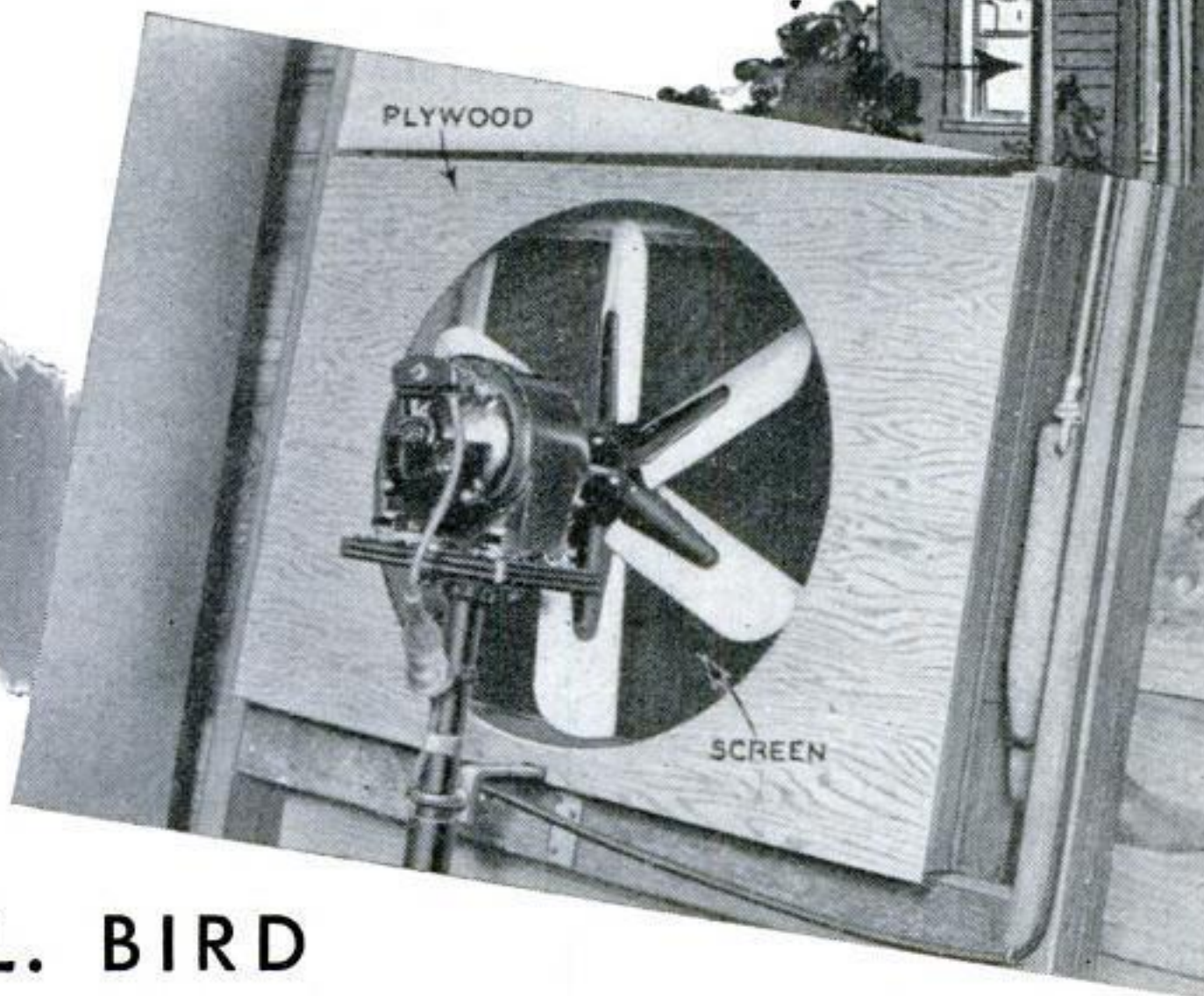
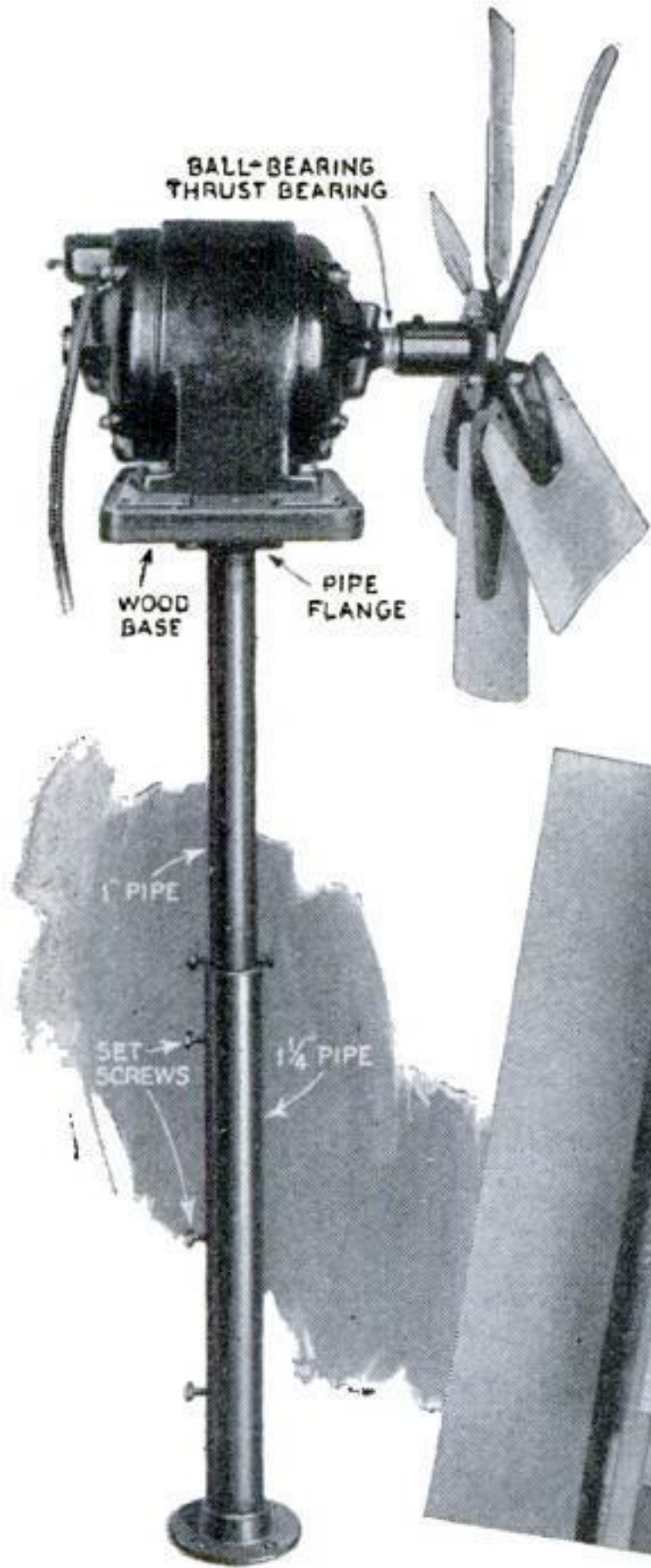
A DISCARDED automobile distributor cap makes a practical combination paper weight and pencil holder. The smooth rim of the hard composition cap slides easily over papers as they are slipped under or drawn from beneath it; and the pencils, held vertical by the ignition-wire sockets, are conveniently spaced and always handy. A suitable cap may be obtained for the asking or a nominal price at almost any automobile repair shop.

Although such a cap is usually heavy enough in itself to serve as a paper weight, it can, if necessary, be partly filled with plaster of Paris to increase the weight. The cap should not be entirely filled because the plaster might rub off on the papers held down by the paper weight. For extra weight, imbed shot in the plaster.—E. L. B.



# Attic Ventilating Fan

**AIRS HOUSE  
QUICKLY  
AFTER  
HOT  
SUMMER  
DAYS**



An old auto-engine fan, installed as at the left, is turned on in the early evening to draw out the superheated air from the attic, as shown above

By J. L. BIRD

**I**N SUMMER, the average attic is a storehouse of heat. It may be thirty or forty degrees hotter than the remainder of the house. This heat penetrates through the ceiling of the rooms below and often makes the sleeping and living quarters almost unbearably warm. Even after the sun goes down, it takes hours for natural ventilation to cool the rooms.

It doesn't require an expensive air-conditioning plant to correct this condition. All that is necessary is to install an attic fan to force the superheated air out and suck in, through the open windows of the remainder of the house, the cooler outside air.

By operating the fan from early evening until time to retire, the average bedroom will become cool enough for comfortable sleeping during most summer nights. When the weather is exceptionally hot, it may be found desirable to run the fan all night. In the warmer sections of the South, attic fans are operated twenty-four hours a day to get the cooling effects of the circulating air.

The cost of a commercial attic-fan installation might be somewhat of a shock to the amateur craftsman who is familiar with motor-powered equipment, but the attic fan to be described can be constructed for much less. Although it may not have all the features of the purchased unit, it will certainly pay the builder valuable dividends in summer comfort.

The fan should have a capacity suffi-

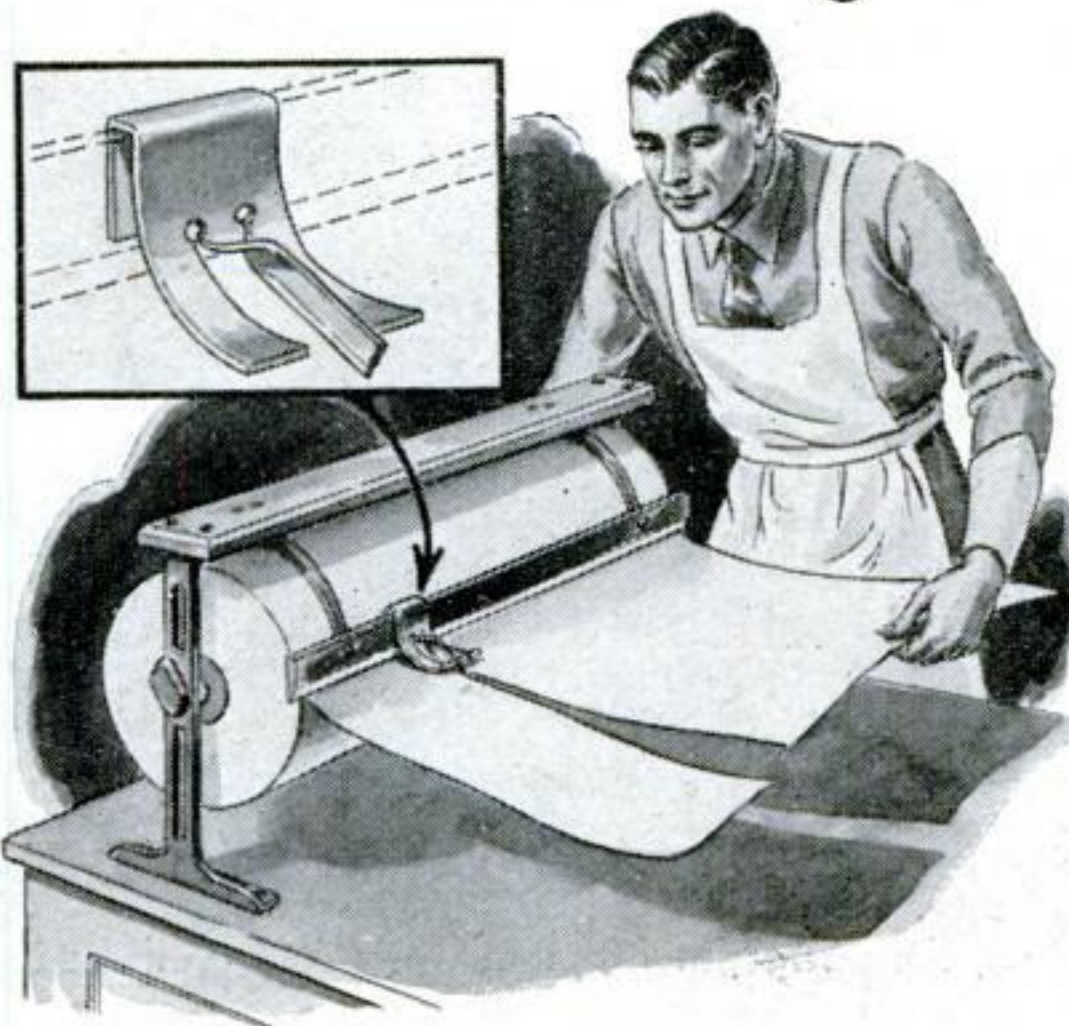
cient to change the air in the entire house completely at least twenty times an hour. The minimum motor rating is  $\frac{1}{8}$  h.p. The unit shown uses a  $\frac{1}{6}$ -h.p. motor operating at 1,140 r.p.m. The fan blade assembly is  $20\frac{1}{2}$  in. in diameter, and is the engine fan of a well-known make of automobile. It was purchased from an auto junk yard for one dollar. The installation was made in the attic of a medium-size, seven-room house and produces an estimated thirty complete air changes an hour.

When the builder is selecting the motor and fan, he should consider the

noise factor as well as the air capacity. Probably most home workers will use a 1,750-r.p.m. motor; in fact, a shop motor that is not in great demand during the summer months might be used. A large, multibladed fan, unless it is of the latest noiseless type, will make some noise when operated at high speed. It is suggested that a four- or six-blade fan 16 or 18 in. in diameter be used with a  $\frac{1}{4}$ -h.p., 1,750-r.p.m. motor. If a 1,140-r.p.m. motor is available, it will be possible to swing a larger diameter fan with less noise and the same air delivery.

It will probably be necessary to alter the fan hub to fit the motor shaft. If equipment is not available, a machine shop will make the alterations for a nominal sum. (*Continued on page 113*)

## Cutter for Slitting Roll Wrapping Paper



**MADE** in a few minutes from a 3-in. piece of 1-in. band iron, with the aid of a flat file and a pair of tin snips, the cutter illustrated is hooked on the shearing blade of a wrapping-paper holder of the ordinary commercial type. It may then be moved along the blade for cutting various widths of paper, thus saving the waste that occurs when wider paper than needed is used for small parcels. Another use for the device is when long, narrow strips have to be prepared for window or counter decoration. All that is necessary is to hook one or more cutters of the same type to the shearing blade.—CHARLES M. RICE.



# This RACING YACHT



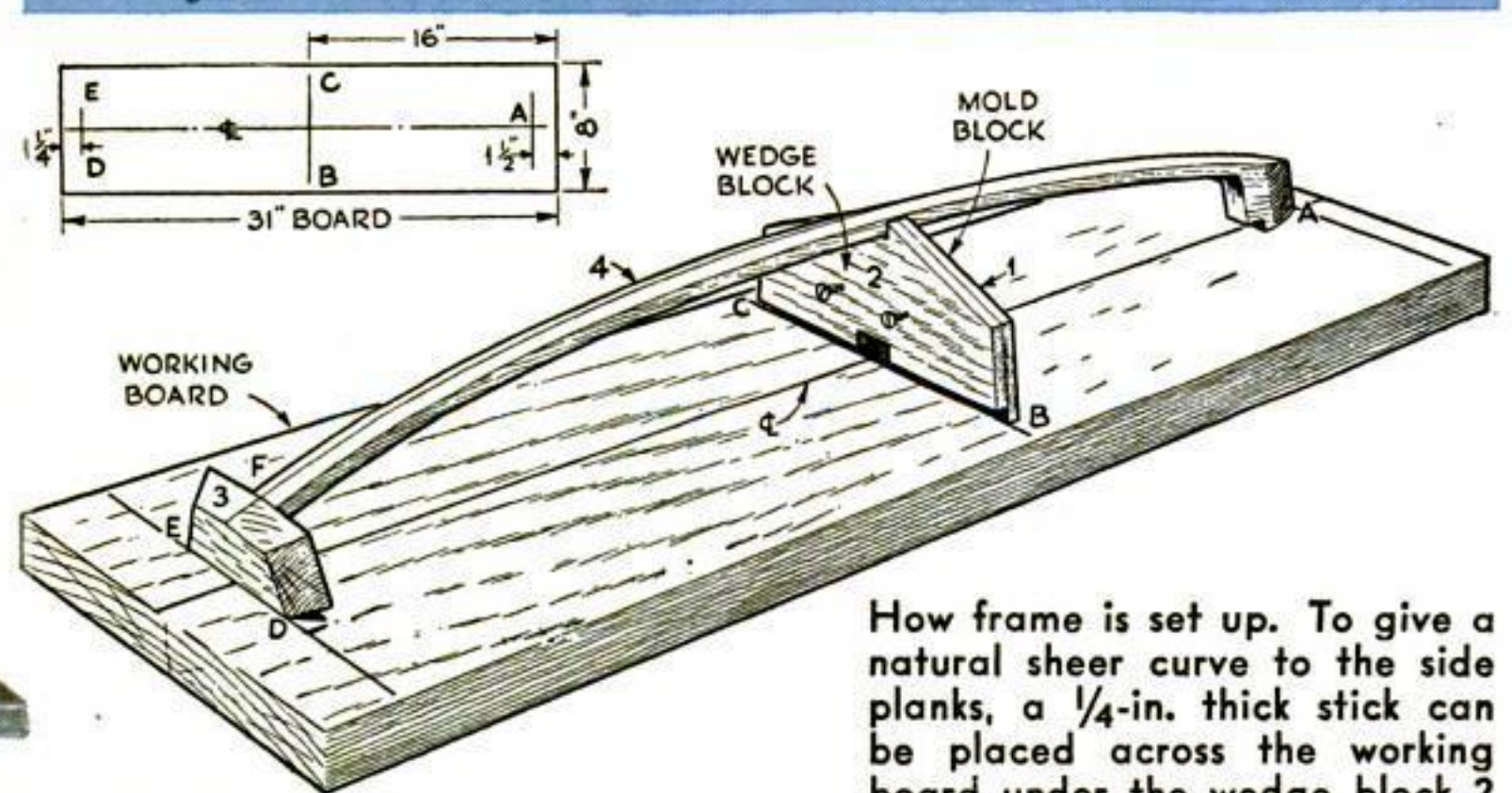
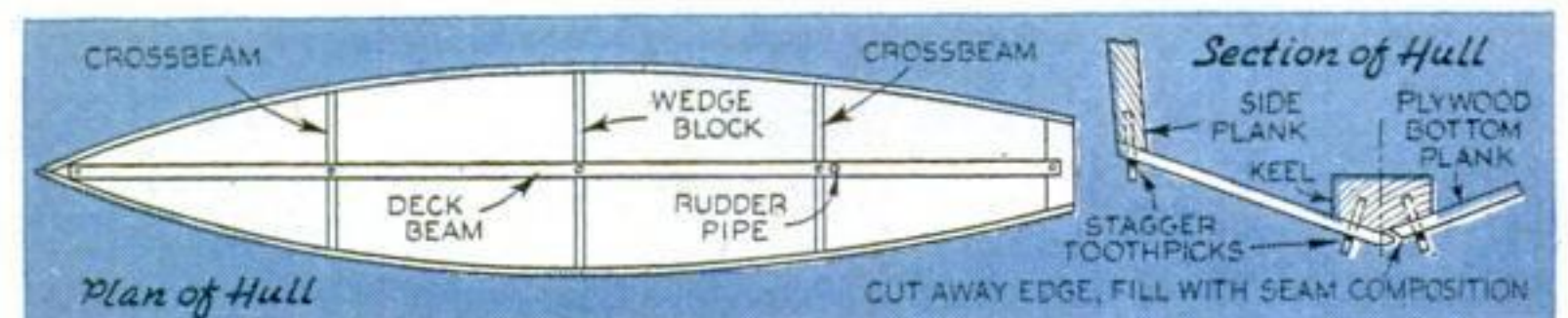
**S**IMPLICITY of construction and extraordinary speed are the features of this sailing model. Boys can build the hull without difficulty; in fact, twenty-three have already done so under the direction of Perry L. Schneider, a shopwork teacher in Brooklyn, N. Y.

It was with a homemade yacht of this design that my son won the 1936 championship of Greater New York in Class 6 for constructed models up to 30 in. Identical models have also been winners in a number of other contests.

The model is a V-bottom skipjack, Marconi-rigged sloop, with a 29-in. long hull and a beam of 7 in. All the usual difficulty of carving and gouging out the hull from a glued-up block of wood has been avoided by a unique method of built-up construction. The keel and stem are in one piece, and the two side planks are lapped at the stem to form a watertight joint. The automatic steering device also has been greatly simplified.

First, lay out a working board  $\frac{3}{4}$  by 8 by 31 in., as shown. Cut mold block 1 and wedge block 2 to shape and join temporarily with two screws so that the notches cut for the keel fit opposite each other. Cut keel and stem in one piece, then bevel as shown, and drill hole at *F*. Place on working board so bow end of keel is at *A* and stern side of mold block on line *BC*. Apply glue to keel at *A* and *F*, to mold block at *BC*, and to stern block at *DE*. Allow to set overnight.

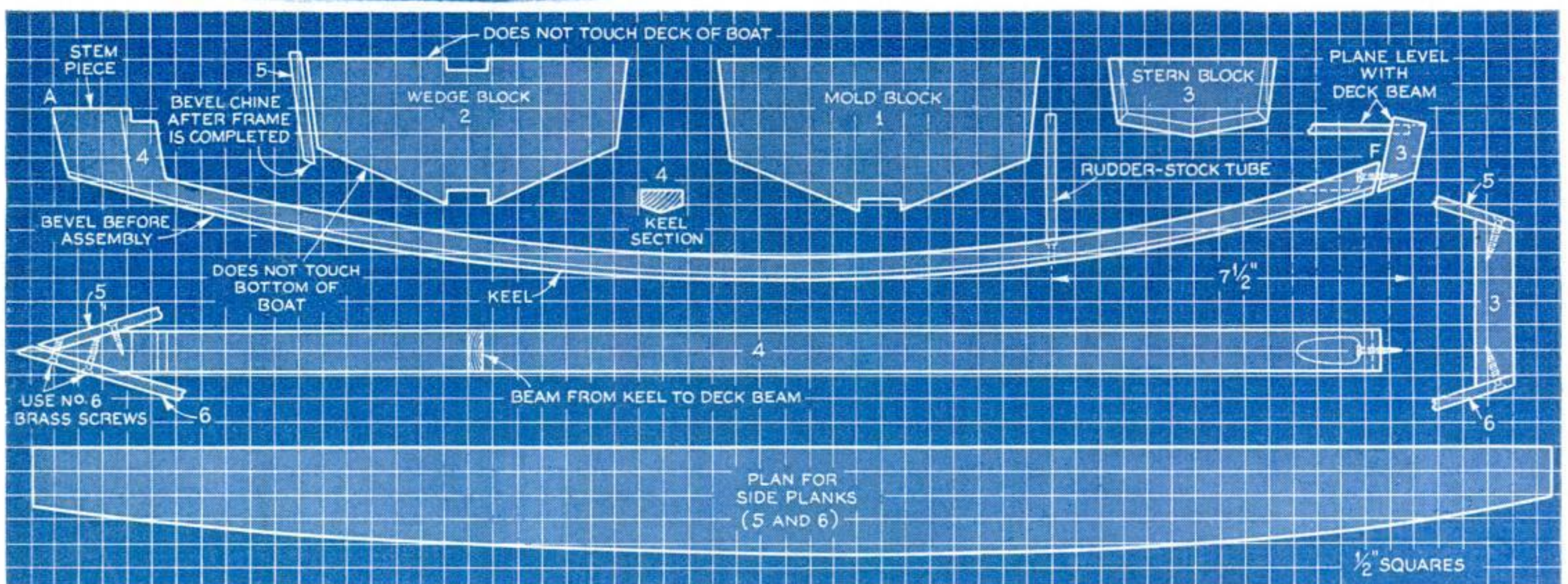
Clamp side planks together and shape so they are exactly alike in outline. Fasten piece 5 at *D* with two screws, bend around the double blocks, and fasten to stem with two screws, one near deck and the other near chine. Cut off end at *A* in a plane with oppo-



How frame is set up. To give a natural sheer curve to the side planks, a  $\frac{1}{4}$ -in. thick stick can be placed across the working board under the wedge block 2

A V-bottom skipjack, Marconi-rigged sloop. The hull length is 29 in.; beam, 7 in. Built-up construction is used to avoid all carving and gouging

The side planks are carefully matched before being attached to the stem and stern. Later the mold block is discarded



Patterns for the combination keel and stem, the wedge, mold, and stern blocks, and the topside planks; and two details of the assembly



# Won a Championship

site side of keel. Fasten piece 6 at *E*, bend around the double blocks to stem at *A* outside of piece 5. Trim to make a tight fit, fasten 6 to stem with two screws, then fasten 5 to 6 with two screws. Always drill holes before inserting screws. Fasten stern block to keel with screw at *F*.

To remove frame from board, take out screws holding wedge block to mold block and with a thin hack-saw blade, saw away the glued parts at *A* and *DE*.

Drill a  $\frac{1}{8}$ -in. hole through keel vertical to deck  $7\frac{1}{2}$  in. from stern, and on inside of keel drill a  $\frac{1}{4}$ -in. hole  $\frac{1}{8}$  in. deep for rudder-stock tube. Fit deck beam into notches in stem piece, wedge block, and stern block, and fasten with screws. Drill a  $\frac{1}{4}$ -in. hole in line with hole in keel and insert the rudder-stock tube in place.

Mark points on center of deck beam at crossbeam sections and measure to outside edge of the two side planks; then force these planks to either side as necessary so that both outside edges are equidistant from deck beam.

Attach cross beam in front of rudder tube with a screw through center of deck beam and with toothpicks wedged through the side planks. Insert a beam  $9\frac{1}{2}$  in. from bow between keel and deck beam, and in front of this attach another cross beam. Apply wood composition around rudder tube at keel to prevent any water from leaking into the hull.

Attach coarse sandpaper to a 6-in. block of wood. Starting at bow, with one end of block resting on keel and other end on side plank, finish edges parallel on an even curve from bow to stern. Cut bottom plywood planks to approximate shape, apply thin layer of boat-seam compound to edges of side plank, and bind one of the bottom planks to frame at bow and stern with wire. Hold a 75-watt lamp inside hull to see where to drill holes for toothpicks used to attach bottom plank to side and keel. Use an automatic hand

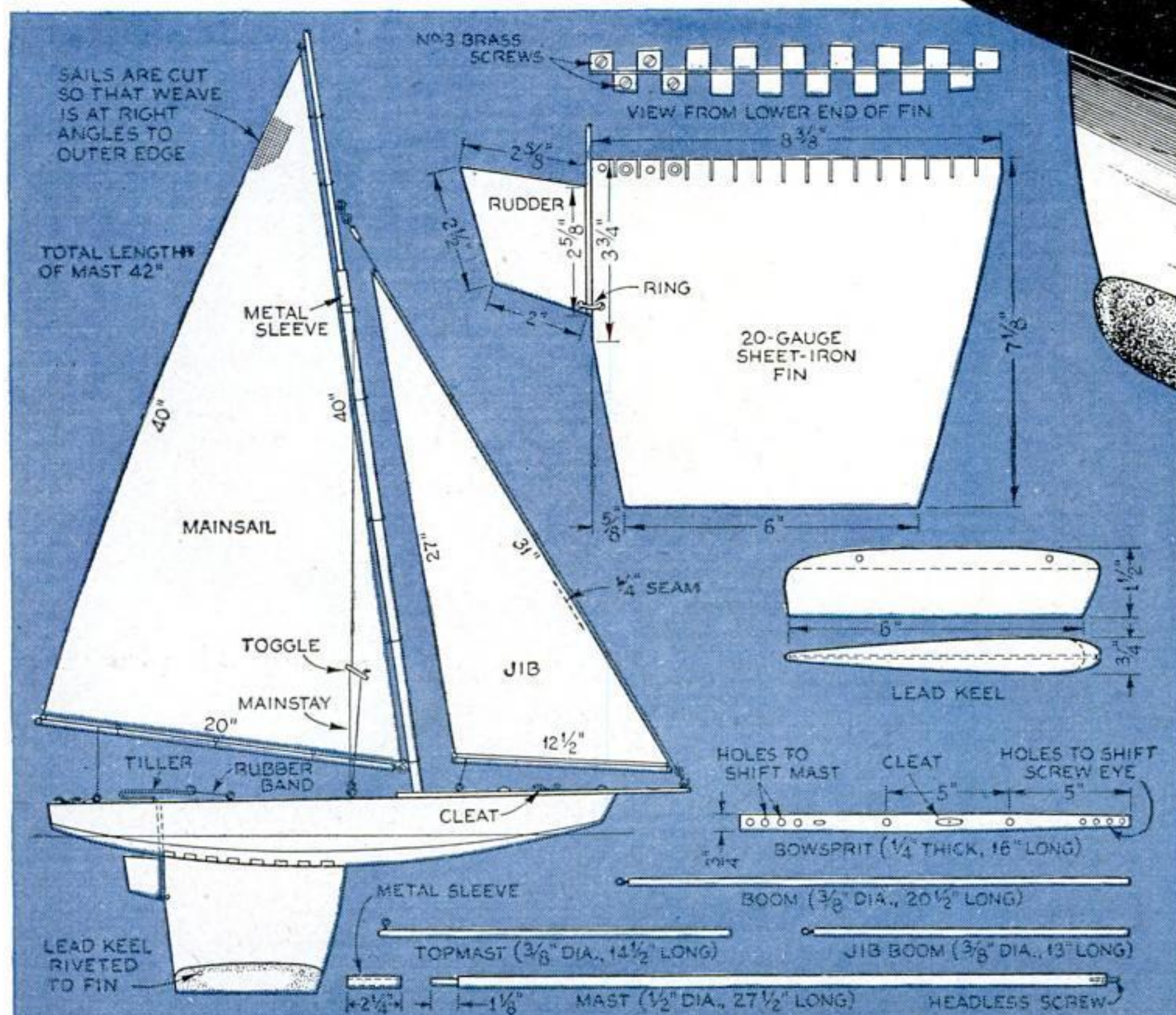
push drill with No. 2 drill, and make the holes  $\frac{1}{2}$  in. apart. Cut toothpicks to proper length and thickness, dip in shellac, and, starting at the center, hammer them into the holes. Trim off flush and sandpaper.

After the plank is properly attached, cut it flush with side of boat and off center along *(Continued on page 103)*

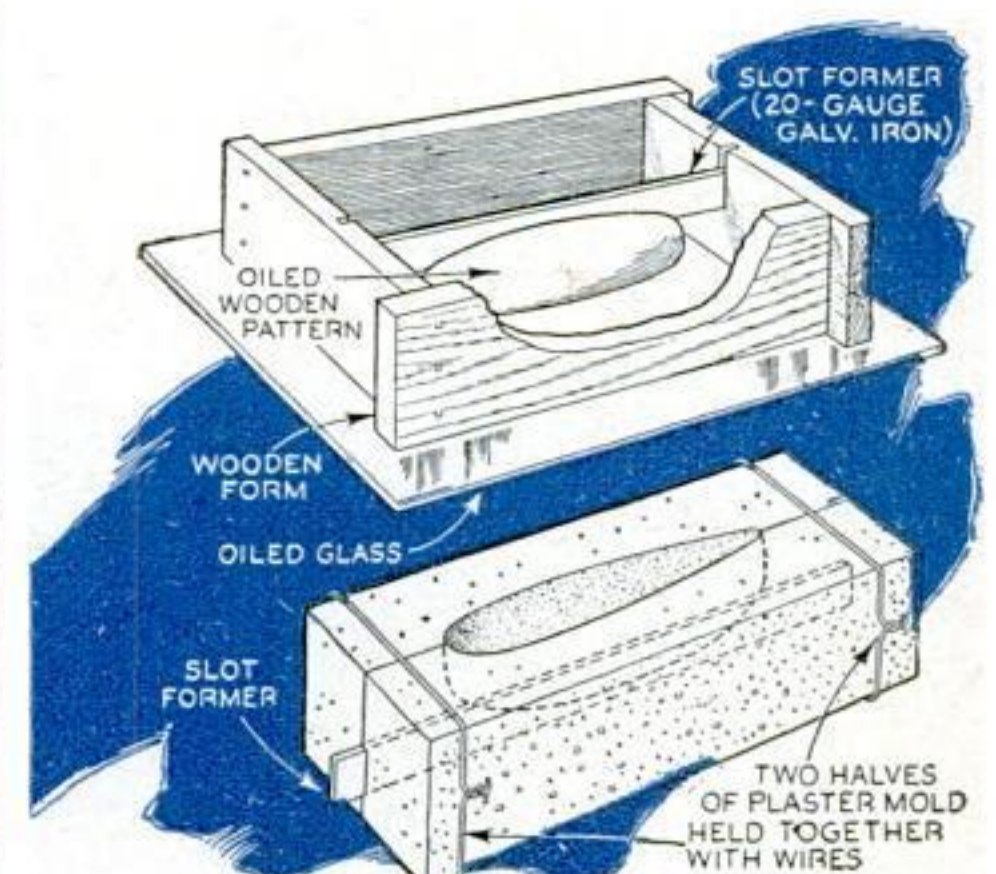


**Unusually speedy as the boat is, the construction is of a simple type, well adapted to the beginner**

**By BERNARD FISCHLER**



Sketch showing the bowsprit with holes for shifting mast, and the automatic steering device. Below, how mold for lead keel is made





# Fish-Bowl Funnies and



Painting the water-filled bowl with a mirror set up to show how the work will appear from the front. Fairy-tale scenes are especially appropriate



When viewed through the water, all the scenes appear grotesquely magnified and have a third-dimensional aspect. The dwarfs, for example, look to be right inside the bowl



An unlimited number of pictures can be adapted to this type of work. Another unusual effect can be gained by painting small castles and leaving the windows clear. After the picture is dry, small pieces of bright foil are glued over the windows.—ARCHIE HANSEN.

BY PAINTING various scenes, odd pictures, or comics on one-half the outside surface of small, spherical-shaped fish aquariums in the manner illustrated, many beautiful or weird effects may be obtained without special artistic skill. Because of the spherical shape of the bowl, the pictures appear to have a third dimension, and any distortion that may be present when the picture is not viewed from its focal point, seems to enhance, rather than detract from, the completed view.

Several small brushes, some quick-drying varnish, and a few tubes of regular artists' oil colors or quick-drying enamels are the only materials required.

First, fill the bowl with water and ar-

range it with a mirror behind, as shown. The water has a tendency to enlarge the actual painting, and as the work progresses, the magnified results are constantly viewed in the mirror.

If the picture is to be a simple landscape or something of that type, paint the objects that appear in the foreground first, and work by stages to the background, allowing sufficient time for each object to dry before painting the part immediately behind it. The sky, of course, is painted last. Beautiful cloud effects are created by brushing through the sky paint while still wet with white and shades of gray. After the picture is thoroughly dry, it should be given a coat of some light shade of opaque paint, preferably cream.

## Costume Brooches Cut from Sheet Copper in Shape of Oak Leaves

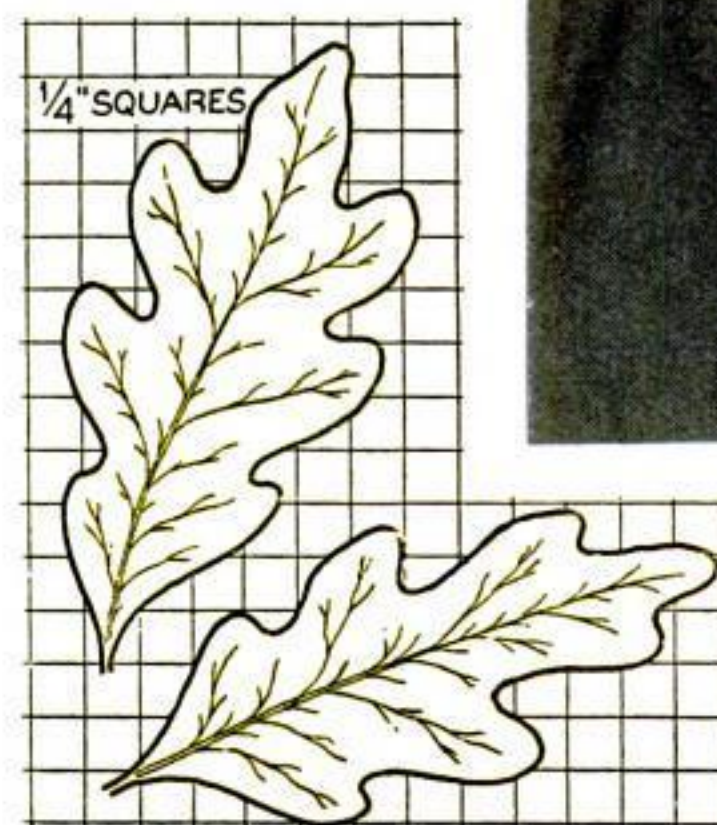
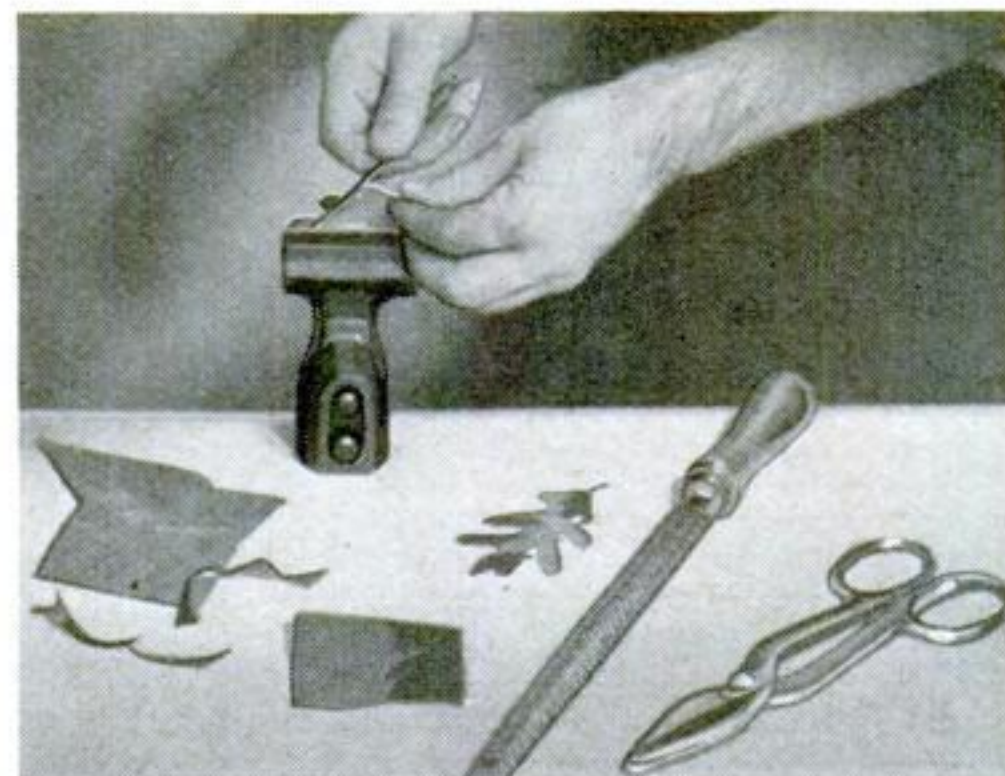
AN OAK-LEAF brooch cut from sheet copper and oxidized to a deep, rich brown makes an attractive piece of costume jewelry. The color closely resembles the natural russet of a real oak leaf in late autumn. Each brooch may be individualized by using a different leaf.

The metal should be soft sheet copper of approximately No. 18 gauge. Trace the leaf on the copper with a lead pencil, and cut it out in the rough with a pair of tin snips. Finish the design accurately with files and fine emery cloth. If you have a jeweler's saw, you may prefer to saw out the design, in which case very little filing will be necessary.

The veining lines are first marked with a lead pencil, then indented with a blunt cold chisel, or any tool, such as a screw driver, that has first been filed or ground to produce the desired effect.

After the design has been finished, the metal

should be planished with a smooth, flat-faced hammer in order to harden the soft metal. The metal should then be thoroughly cleaned with a household scouring powder, and finally with soap and water. To oxidize it, lay the design, face up, on a hot metal surface, such as the top of a cooking stove, and heat it just long enough to cause the copper to take on the desired russet color. When cool, polish the metal with a cloth, and coat the face with clear lacquer or thin varnish. The fastening device may be taken from a discarded brooch.—GEORGE A. SMITH.



Left, two patterns. Extreme left, filing the cut edges. Above, one of the finished brooches



# Other Craftwork Ideas

## Decorated with Indian Drummer Boys

Other

Coat Rack  
hang their  
their own  
as designed  
e  
se  
ad  
ur  
an  
by  
gn  
ill-  
of  
ded

the figures, then turn over the sheet of paper containing the full-size drawing and trace the design on the reverse side of each cut-out part.

The upright, 3 ft. 10½ in. long, is 2½ in. square for 12½ in. at the lower end. It then tapers to 2¼ in. square at the top. A block ¾ by 2½ by 2½ in. is nailed to the top of the upright.

For the base, two pieces ¾ by 2½ by 17½ in. are needed. They are assembled with a cross-lap joint as shown. The four feet, each ¾ by 2½ by 3 in., are then nailed in place, and the base is fastened to the upright from below with two large wood screws.

The four Indian figures are nailed to the cross bars from the bottom, and a long, thin brad is driven at a downward

angle through the top of each headdress into the upright.

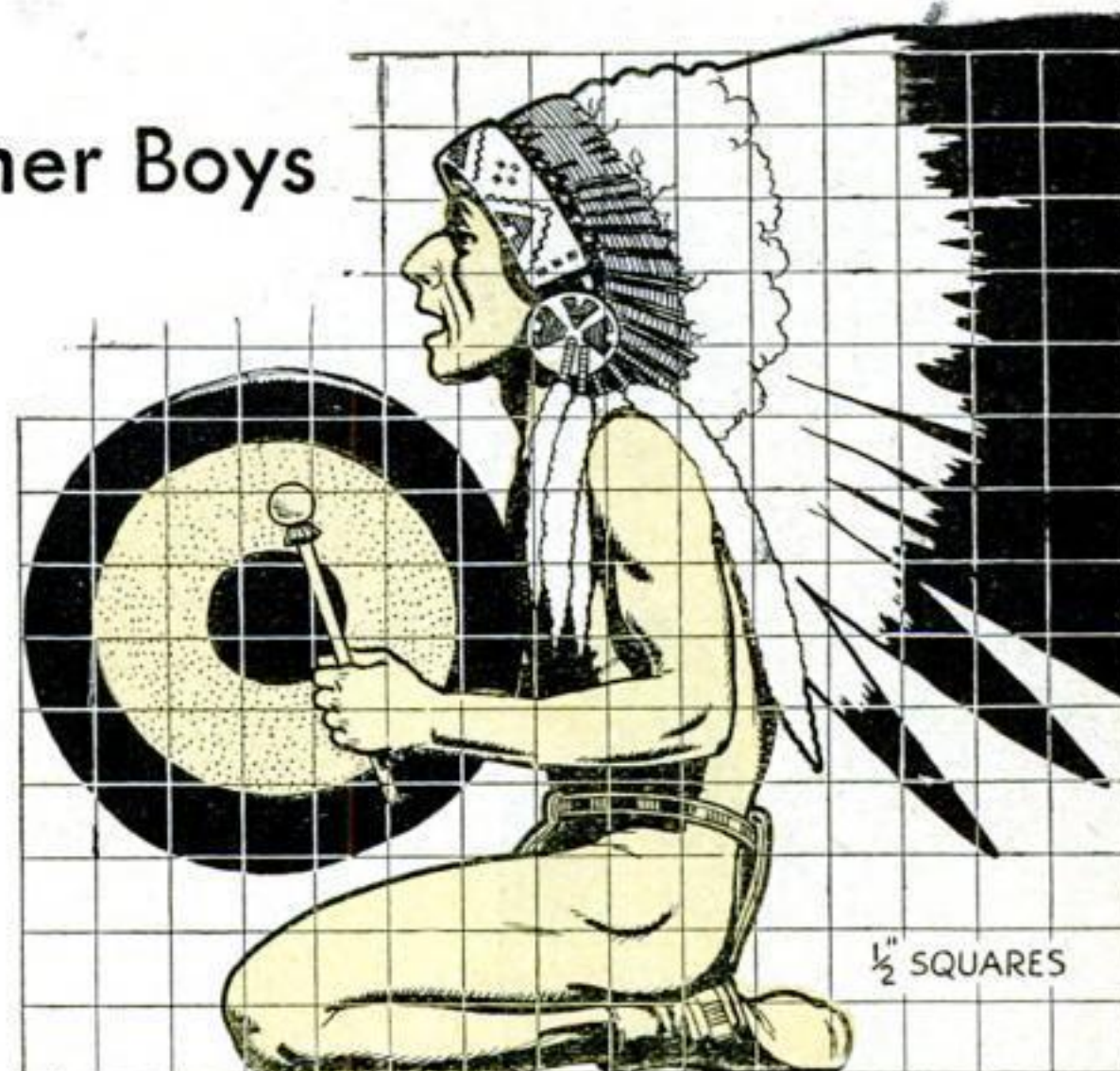
Sandpaper the whole thoroughly, rounding the corners slightly, and fill all nail holes. Paint the upright any color suitable for the room in which the coat rack is to stand.

Color the boys brown and the shadows black. The feathers are white with black tips; the fur, white. The base or quill ends of the feathers are red with a yellow spot below. The brow band is white with a design in red and light and dark blue. The belt has green edges and a blue and red design, and the breech clout looped over the belt is red with yellow edges.

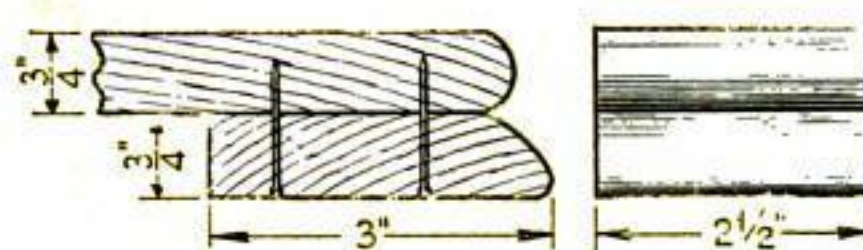
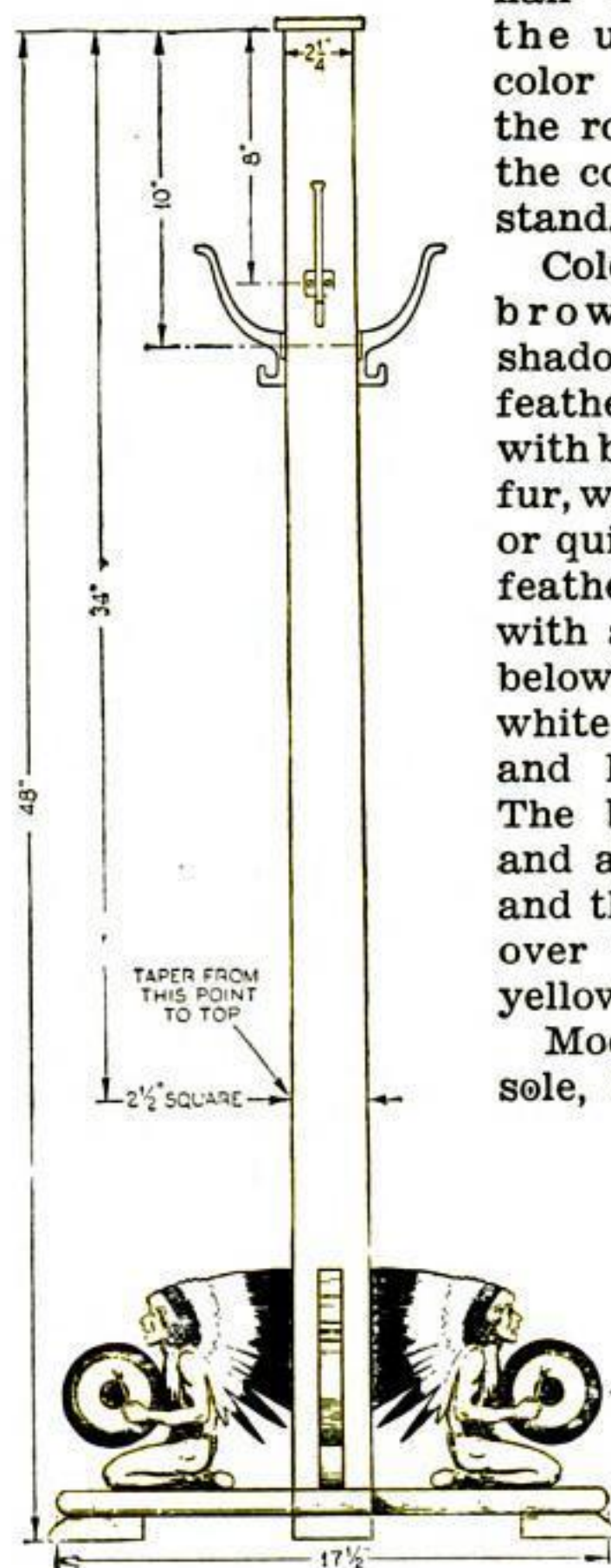
Moccasins have a brown sole, then a strip of white

with a blue design. Over the instep is a red and yellow striped design, and the cuff is tan with a red edge. The drumstick has a green handle and a red ball. The center of the drum is black, next there is a broad yellow ring, and the outer rim is red.

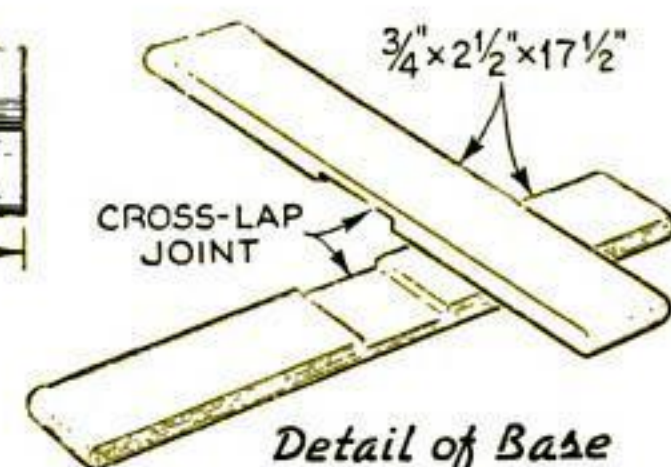
When the paint is thoroughly dry, give the whole project a coat of transparent varnish.—GRAY WOLF.



Drummer-boy design on squares for easy enlargement



The assembled coat rack, side and end views of feet, and base members



The lamp is really a ceiling fixture with a white glass globe. The porcelain socket is screwed to a plywood disk, which fits inside the fixture

## Novel Radio Lamp Looks Like Planet Saturn

RESEMBLING the planet Saturn, this lamp provides an unusual and attractive bit of illumination for radio cabinet or center table.

The globe is a so-called 3¼ by 6-in. white glass ball, which you can get at an electrical supply shop, together with a brass ceiling fixture and an ordinary porcelain socket. Screw the latter to the center of a plywood disk fitting snugly into the base of the ceiling fix-

ture, which is used in an inverted position. In order to provide the markings seen on most planets when they are viewed through a telescope, a large sheet of white tissue paper may be slightly crumpled and thrust inside the glass ball. A plain frosted bulb of about 30 watts is recommended, although the lamp makes an effective night light with a 7½-watt bulb.

The Saturn "ring" is a disk of brass, aluminum, or stainless steel, of 10-in. diameter and with a 5⅞-in. disk cut from the center. Least expensive to use is the bottom of a ten-cent aluminum cake pan. The "ring" is most ornamental when in a slightly tilted position, but if desired, it can be moved about like any small shade that springs over the light bulb.



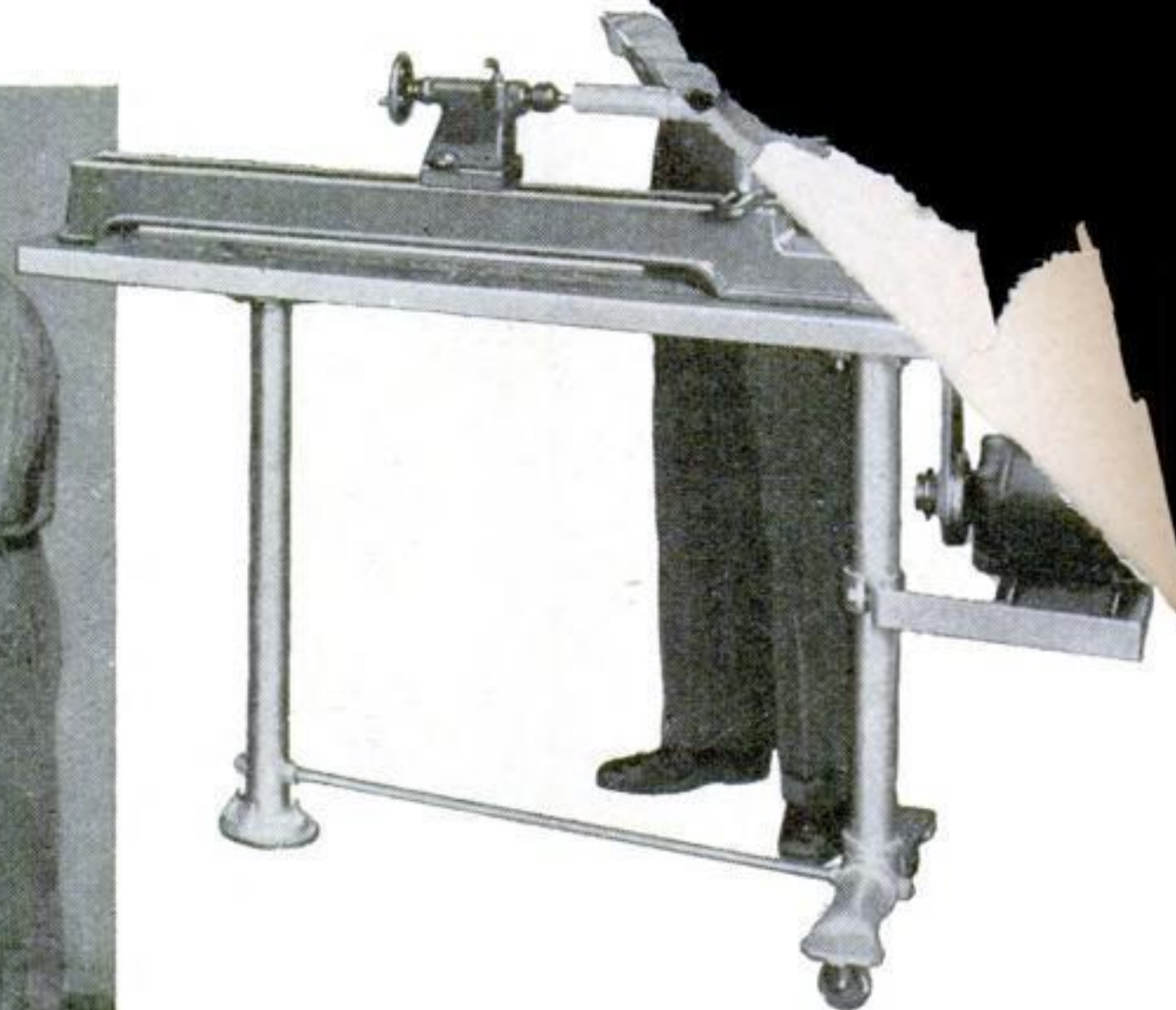
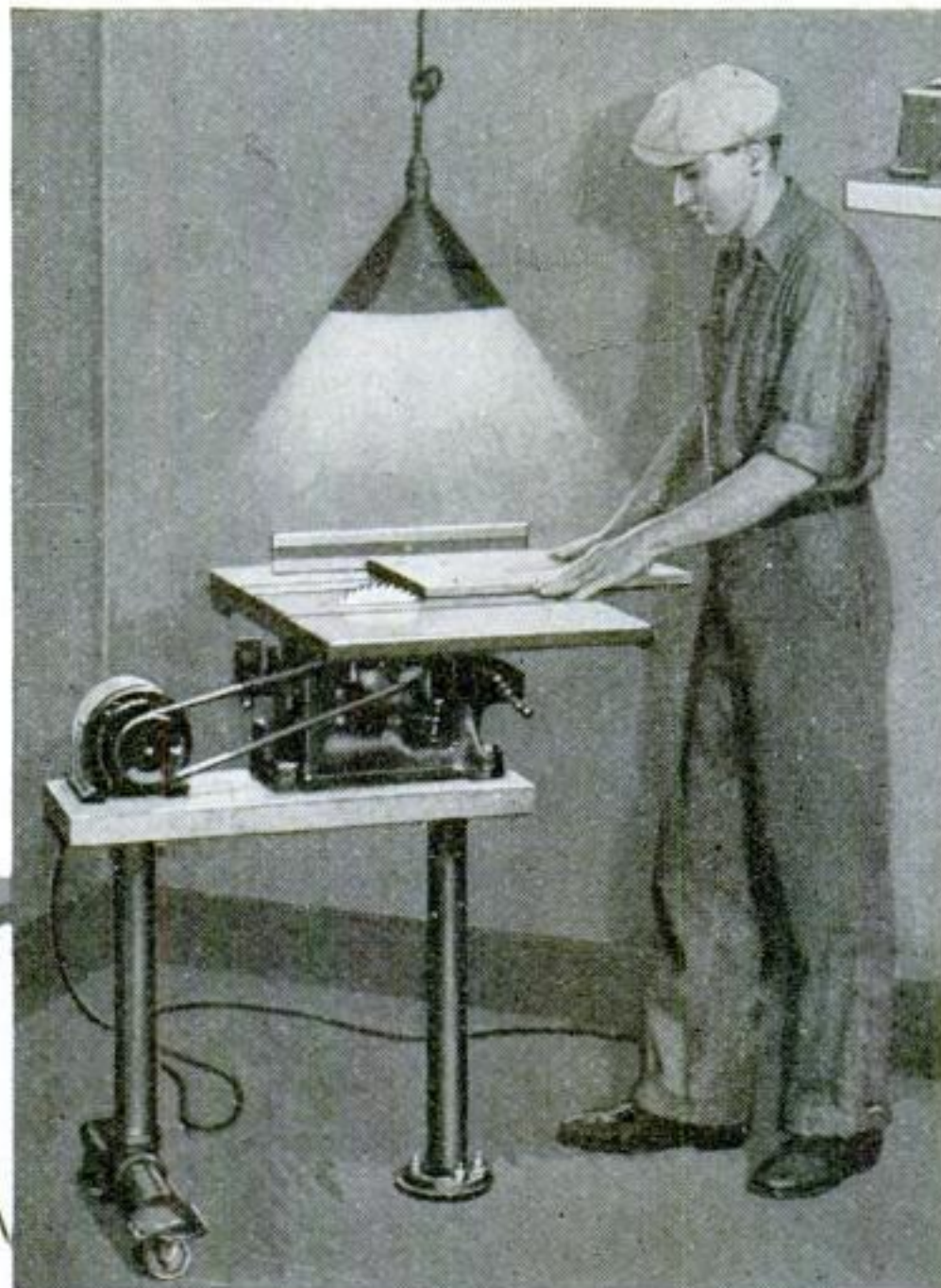
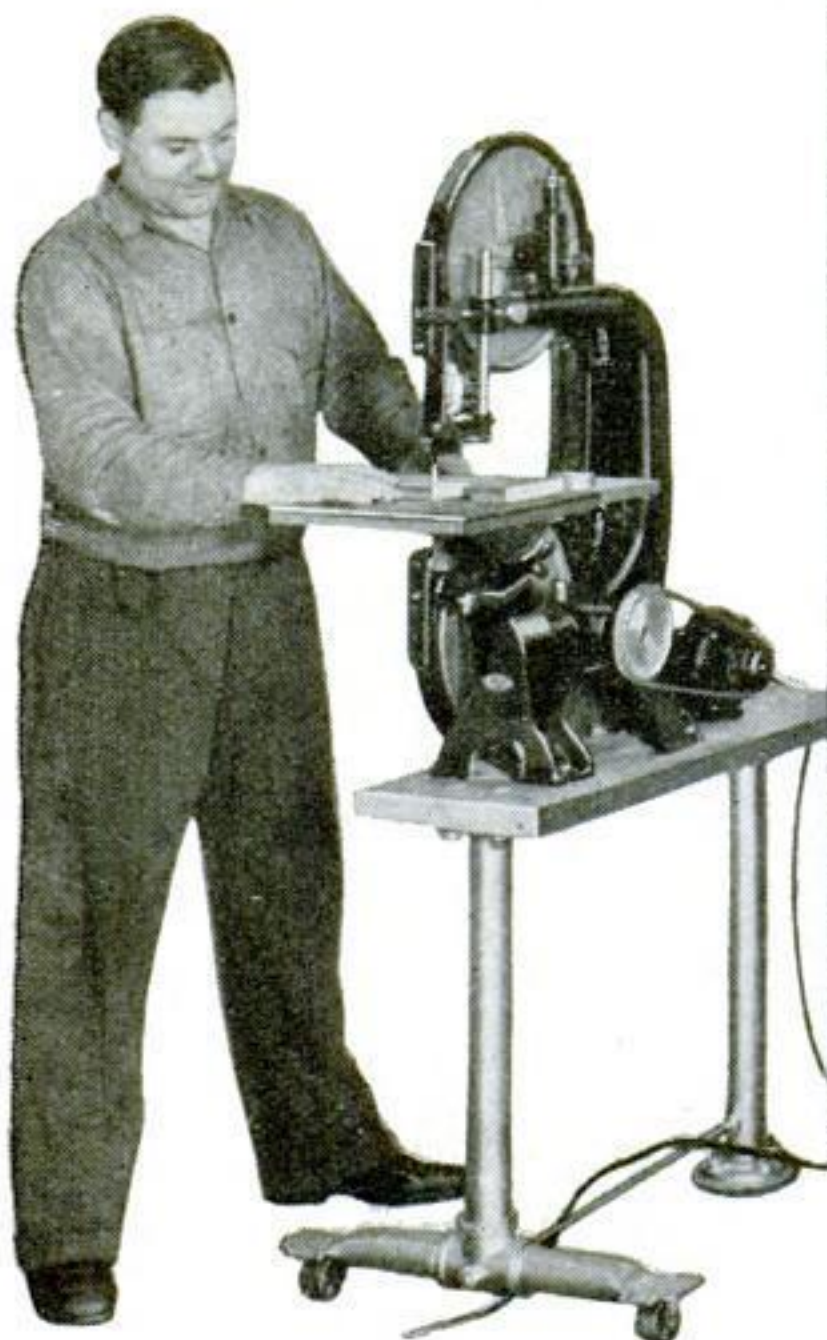
The metal ring, cut to fit the globe, is rubbed to a satin finish with medium-grade steel wool



# Many New Workshops

## STARTED BY GUILD CLUBS

Equipment in the workshop of the Staley Handicraft Club, Decatur, Ill., is on casters so that it can be moved about



shops report that there is a great increase in interest. Many members, having learned how to use power equipment, are now installing machines in their own home workshops. Of course, some club shops are small, but in every case the members plan to add to the equipment.

Approximately \$350,000 was spent by Guild members for new tools and supplies during 1937. Since only a small percentage of the home workshop enthusiasts who read *POPULAR SCIENCE MONTHLY* belong to Guild clubs, the total amount spent by all readers must have run into millions.

In 1936 the average club had 23 members; in 1937, 25 members. The average age of the members is 32 years. Nearly three quarters of the clubs have libraries containing magazines, books, and plans.

Annual club reports show that fifty-four percent of the clubs have received coöperation from hardware dealers in the form of *(Continued on page 98)*

**O**NE in every four clubs affiliated with the National Homeworkshop Guild now has its own workshop. Two years ago there was hardly a club shop in the country. Almost overnight they have sprung up—an answer to a keenly felt need for a central meeting place where processes could be adequately demonstrated, where members could work together on group projects, and where all could share the use of a wide variety of tools.

This healthy growth promises to continue steadily. Secretaries of clubs that have



By means of mass production, the Lakeside Homeworkshop Club of Muskegon, Mich., was able to build 750 animal toys and pushmobiles. These were turned over to the Goodfellows Club for distribution among the city's underprivileged

### WHAT CLUBS ARE DOING TO AID THEIR COMMUNITIES

**G**UILD clubs are always willing to extend a helping hand in their communities and during the past twelve months have undertaken many unusual activities. A few of them are listed below.

Gave picnic for crippled children—Lambert Homecraft Association, Chicago, Ill.

Repaired furniture for persons who could not afford new pieces—Hardwood Homeworkshop Club, Neenah, Wisc.

Sponsored a junior hobby club—Buffalo (N.Y.) Homeworkshop Club.

Made game tables for local

Y.M.C.A.—Oneonta (N.Y.) Homeworkshop Club.

Conducted annual auction of articles made by members to raise money for clothing for poor children—Jacksonville (Fla.) Homeworkshop Club.

Built hat-and-coat racks for rural schools—Mandan (N.Dak.) Handicraft Club.

Made bookcases for local library—Wood-Ridge (N.J.) Homeworkshop Club.

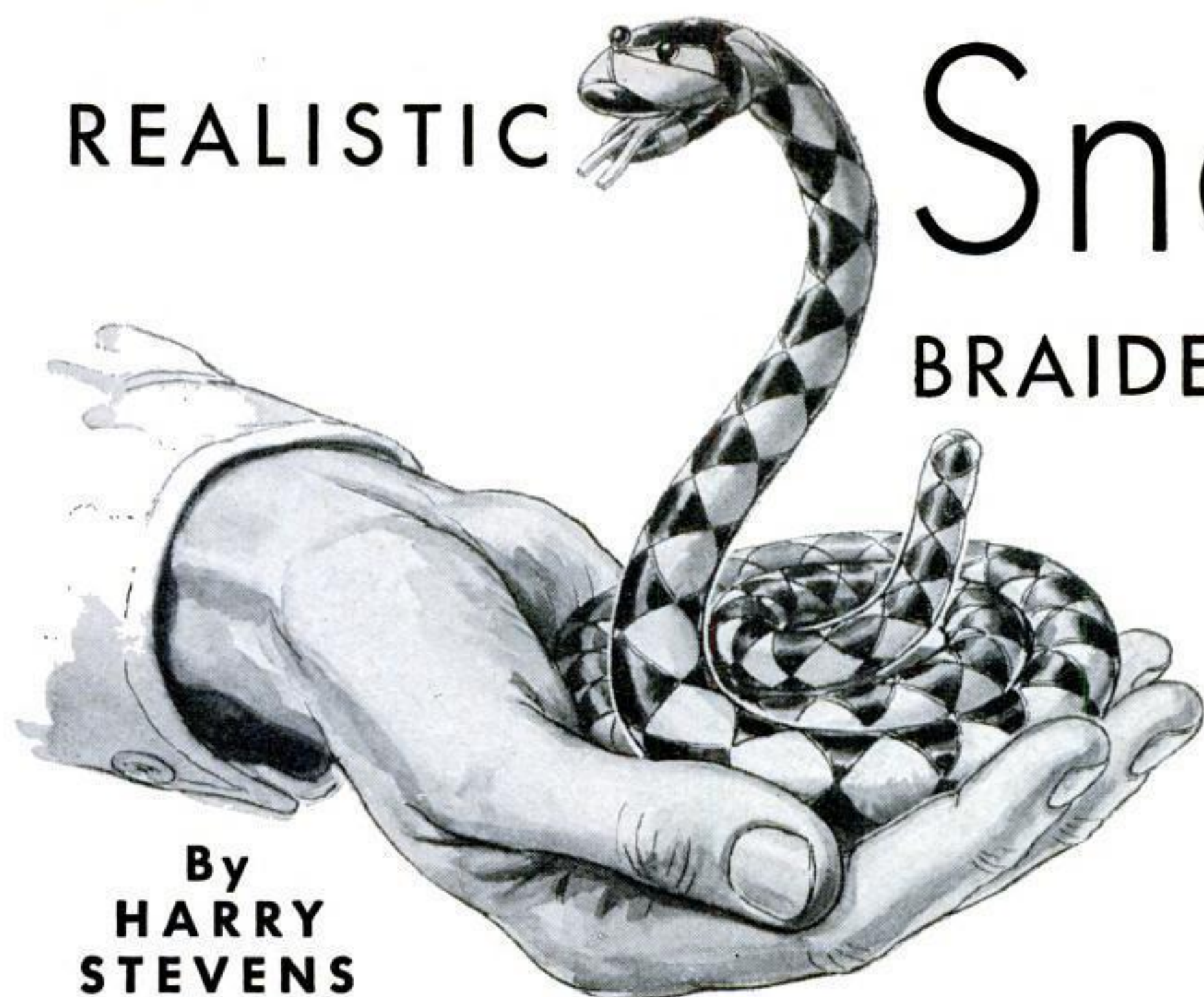
Sponsored Boy Scout troops—Brookhaven Homeworkshop Club, Chester, Pa., and Domestic and Juvenile Court Officers' Club, Toledo, Ohio.



REALISTIC

# Snakes

BRAIDED FROM LEATHER



By  
**HARRY  
STEVENS**

**Y**OU can pose as an amateur snake charmer and give your friends some unexpected thrills by making a snake of braided leather as shown in the accompanying illustrations. Coiled as if about to strike, it is surprisingly realistic, and its novelty always evokes admiration for your ingenuity and leather craftsmanship. The work itself is not difficult, once the method is understood.

Soft, pliable leather is the most practical for this purpose. I find the buckskin from a certain tannery in Fredericksburg, Texas, is the best stock of all that I have tried, but you can use whatever leather is available.

The snake illustrated in the large view above is made from black and white buckskin. The material needed for one like it is as follows: Four body strips or strings each 20 in. long, two of them (one white and one black) being  $\frac{3}{8}$  in. wide throughout, the other two being  $\frac{3}{8}$  in. wide for 16 in. and double that width, or  $\frac{3}{4}$  in., for the remaining 4 in. Two black filler or what are customarily referred to as "gut" strings, each  $\frac{3}{8}$  in. wide and 16 in. long. One tan string for a tongue,  $\frac{1}{4}$  in. wide and 5 in. long. One 20-in. length of fine copper wire.

With the copper wire, lace the two gut strings together full length and insert the tan tongue string, as shown in the drawing below. Then lace 3 in. of the remaining 4 in. of the wire through the tongue string. This gives you a gut-and-tongue string laced on the wire, with about 1 in. of the wire and 2 in. of the tongue string unlaced.

Now split the wide ends of the two body strings so that you have four body strings with six head ends. Tie the head ends to a nail or hook in the wall and begin making the body of the reptile by braiding the four body strings

around the gut string, starting 4 in. below the head ends and also 4 in. below the wire end. Pull the four strings tightly as you braid, and continue the entire length of the snake except for the last  $\frac{1}{2}$  in. Braid back these  $\frac{1}{2}$ -in. ends into the tail by tucking the ends back through the folds of the braid.

Then reverse the position of the snake by tying the tail to the nail or hook. Form the head by braiding three of the head strings for the upper jaw, and the remaining three around the folded end of the wire for the lower jaw. The tan string extends between the upper and lower jaws for a tongue, which is adjusted for length by cutting. The ends of the upper and lower jaws are finished by braiding back, the same as for the tail end. Yellow- or green-headed pins are added for eyes.

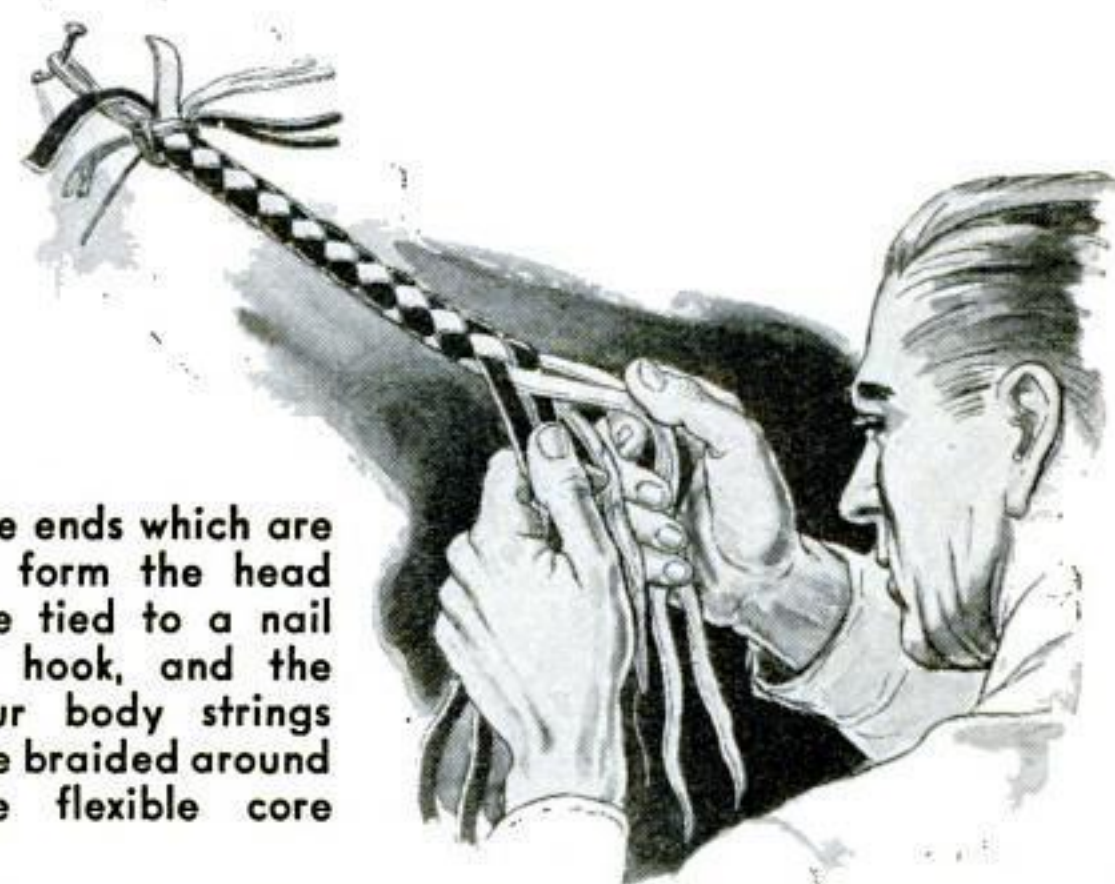
The copper wire running the full length of the reptile makes it possible to have the tail stand erect, as well as to give the striking position that live snakes take when startled or aroused. Like the living reptile, your snake will always be ready to fight.

It is quite possible, of course, to make miniature snakes and coil them for use as bracelets, leather buttons, or other novelties.

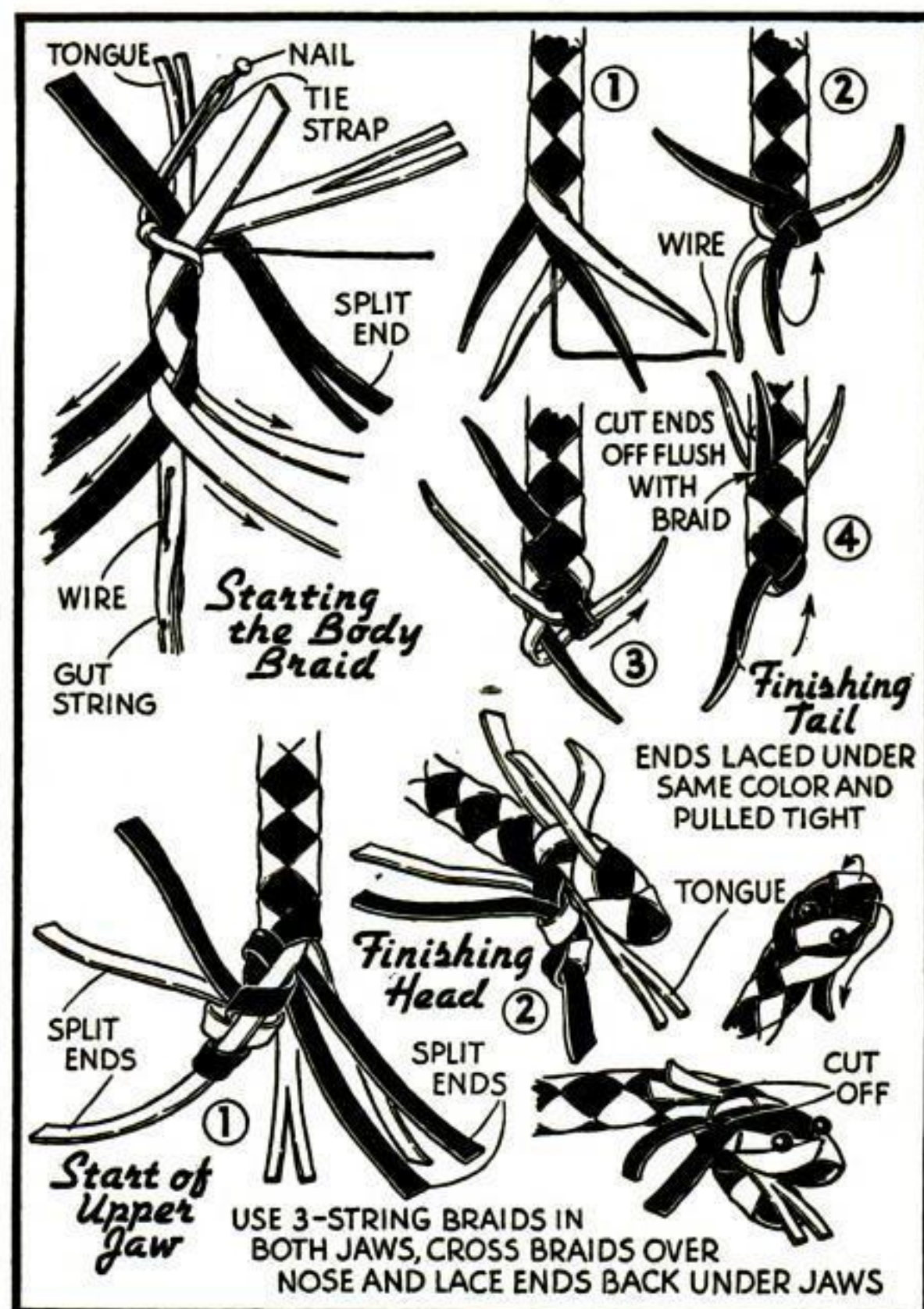
*If you enjoy leather work of this type and would like other articles to be prepared and published in future issues, please send a post card to the Home Workshop Department.*



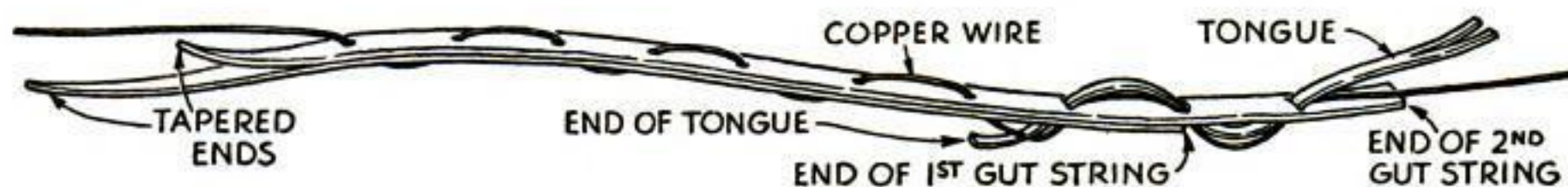
A wire running the length of the snakes makes it easy to coil them in lifelike attitudes, as if about to strike



The ends which are to form the head are tied to a nail or hook, and the four body strings are braided around the flexible core



How the body braid is started, steps in finishing the tail, and details of the head. Left, the core

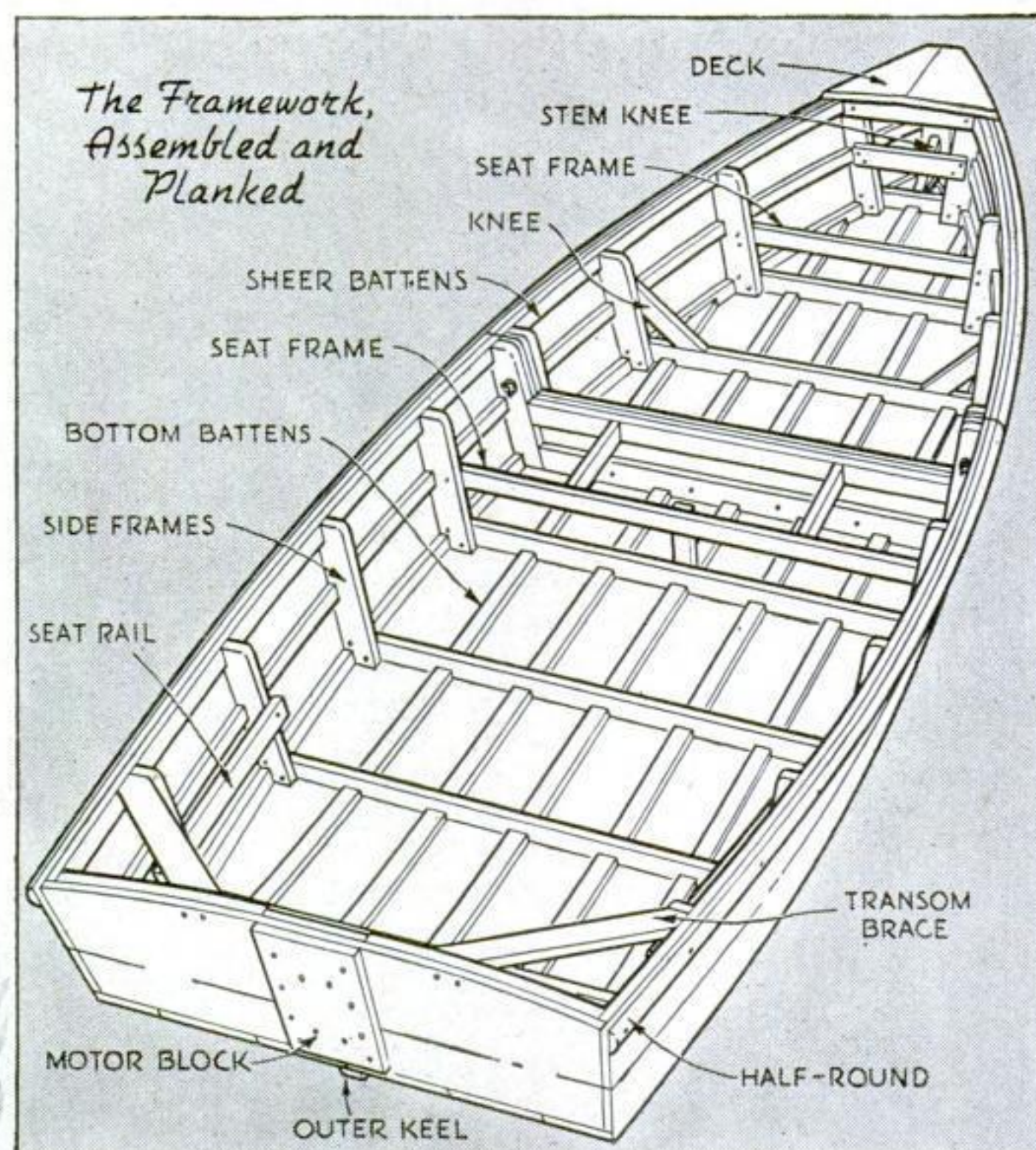




**WILLARD CRANDALL tells  
how to plank and finish our new**

# Portable

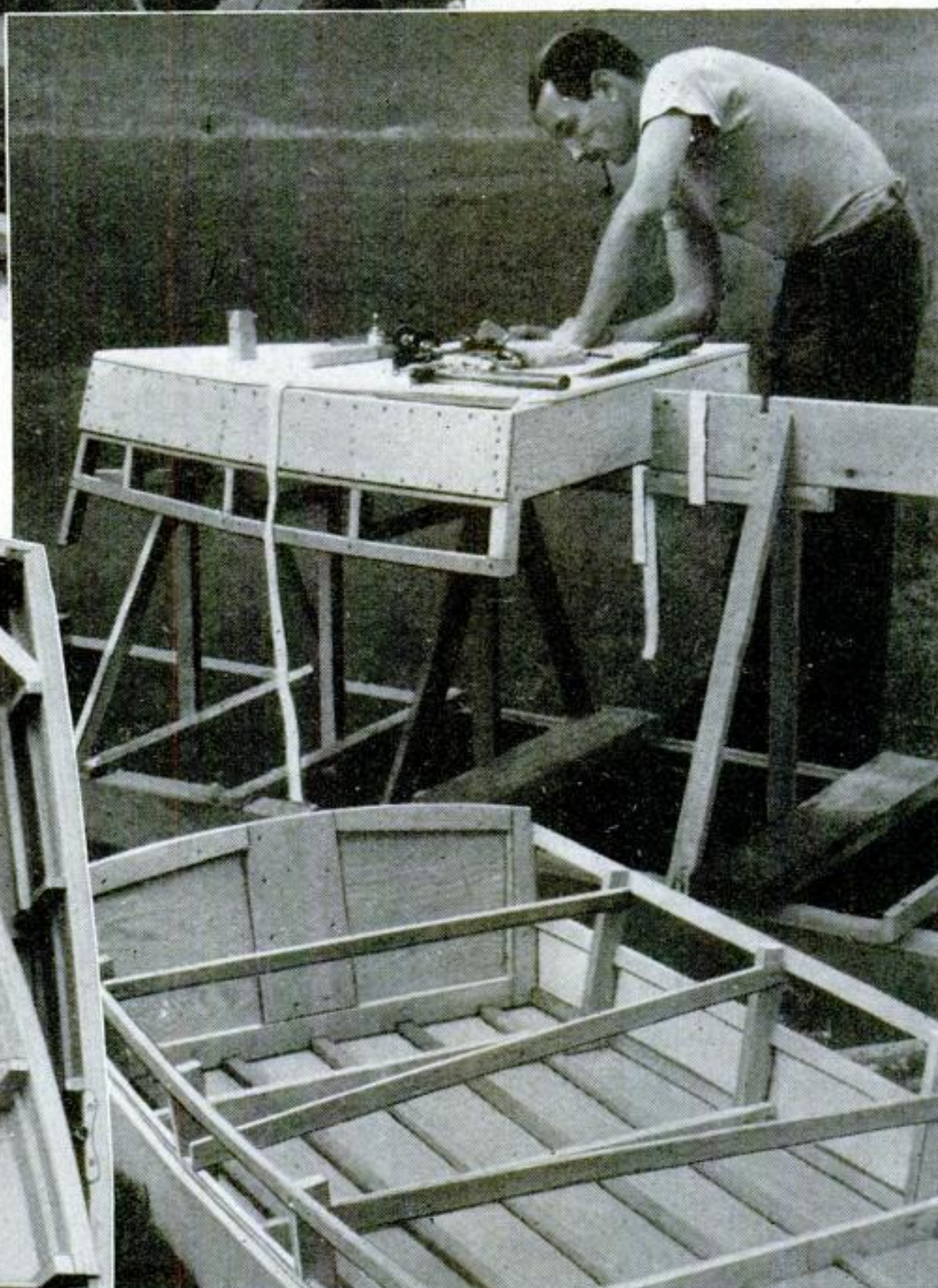
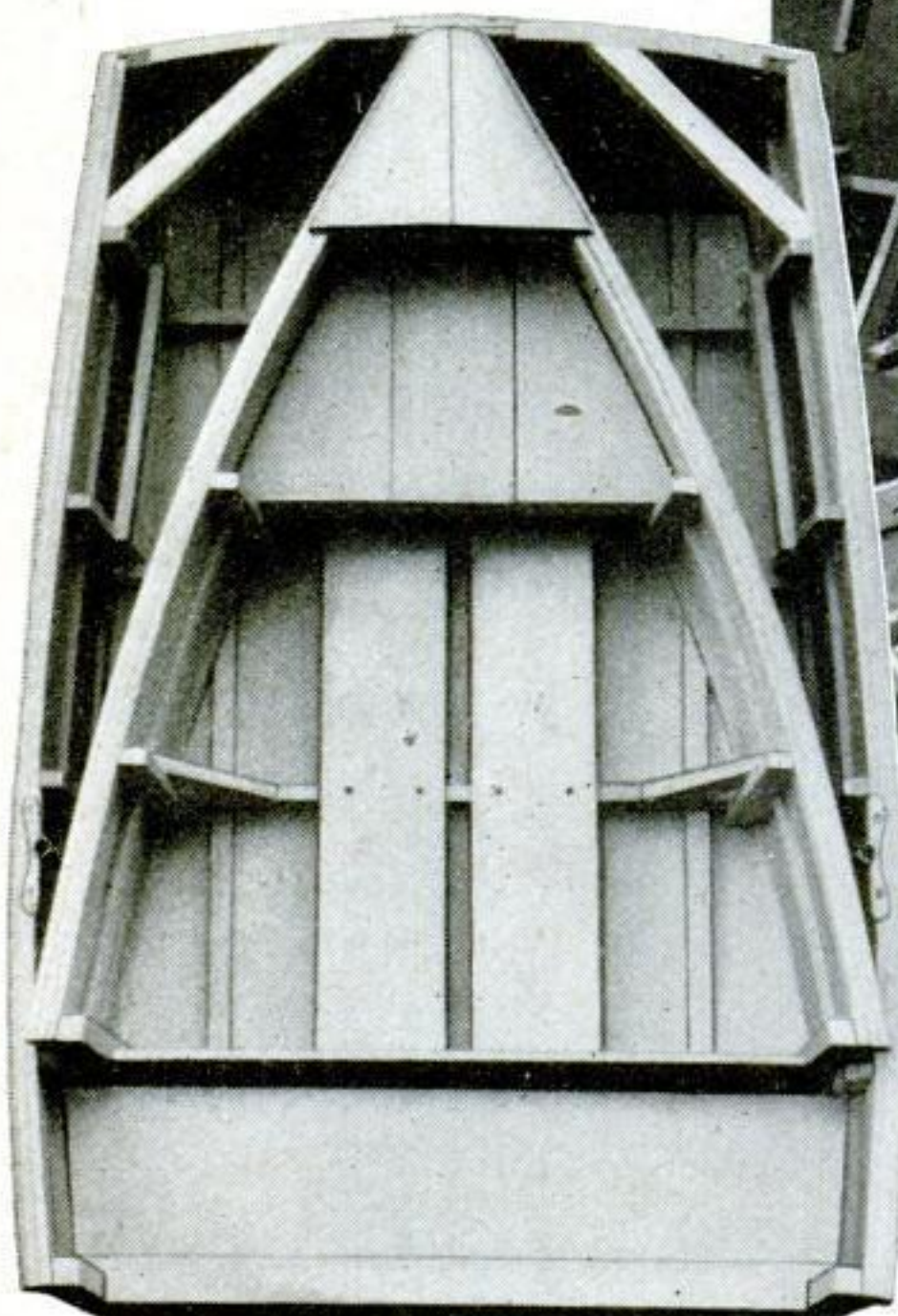
First planks to be applied are the lower sides ones, which may each be put on in one piece and sawed later where the sections join. The stem, transom, bulkheads, chine, and all frames must be trued and beveled



Interior without the seats or floor boards. For extremely light weight, the outside keel and motor block can be omitted



The forward section is removed by unfastening two thumb screws. It is then placed compactly inside the aft section as shown below



The bottom of the aft or larger section should be planked first. It is then removed from the keel form before the forward section is planked. Any protruding planks on both sections are sawed off and planed down at transom, bulkheads, and stem

**A**MONG the many advantages of the new all-wood sectional boat described last month (P.S.M., Apr. '38, p. 69) is the fact that it is comparatively easy to apply the planking to the framework provided the frame is carefully beveled and trued up after the battens are in position.

Start with the lower side planks. They should be dressed down flush with the chine so that the bottom planking will lap over them. The seams between the bottom planks should be left open about 1/16 in. to allow for swelling.

Just before screwing down each plank, coat with marine glue the battens, chines, transom, bulkheads, stem, and all joints that must be waterproof. Then lay a strip of cotton flannelette over the joint and coat the cloth with glue. White lead may be substituted for marine glue if desired. The planks should be fastened with flathead brass, galvanized, or cadmium-plated screws as follows: (1) Into transom, transom frame, bulkhead frames, and stem, 1-in. No. 6, spaced not over 1 in. apart; (2) into frames, 1-in. No. 6, spaced 2 or 3 in. apart; (3) into battens, chines, and keel, 3/4-in. No. 6, spaced 2 or 3 in. apart. To fasten a plank, first clamp it in place, then drill for the screws with a depth stop on the drill, and finally countersink enough to



# 'COME-APART' Boat

allow for covering with putty or seam composition.

The bottom of the aft section should be planked first and removed from the keel form before the forward section is planked. Once planked, the forward section can also be removed from the form, and the protruding planks on both sections sawed off and planed down flush at the transom, bulkheads, and stem.

Then fasten the two sections together with the two 3 by  $\frac{3}{8}$ -in. machine bolts, as shown in the drawings and, placing the boat on horses, put on the topside planks. The side frames will have to be temporarily forced apart until the seats and knees can be put in place. Fewer screws and no marine glue or cotton are necessary in fastening the planks to the sheer batten.

Dress the planking down at the bow so that the outer stem will fit over it. This joint should be coated with marine glue and cotton flannel-ette, and the outer stem screwed to the inner stem with 1-in. No. 8 screws.

The entire inside of the hull should be given at least one coat of paint before work is started on the deck and seats.

Make the deck from left-over planking material—screwed to the deck frame and sheer battens. Transom braces, made from the same material as the frames, should be placed as shown and fastened to the transom frame and side frames with 2-in. No. 10 screws.

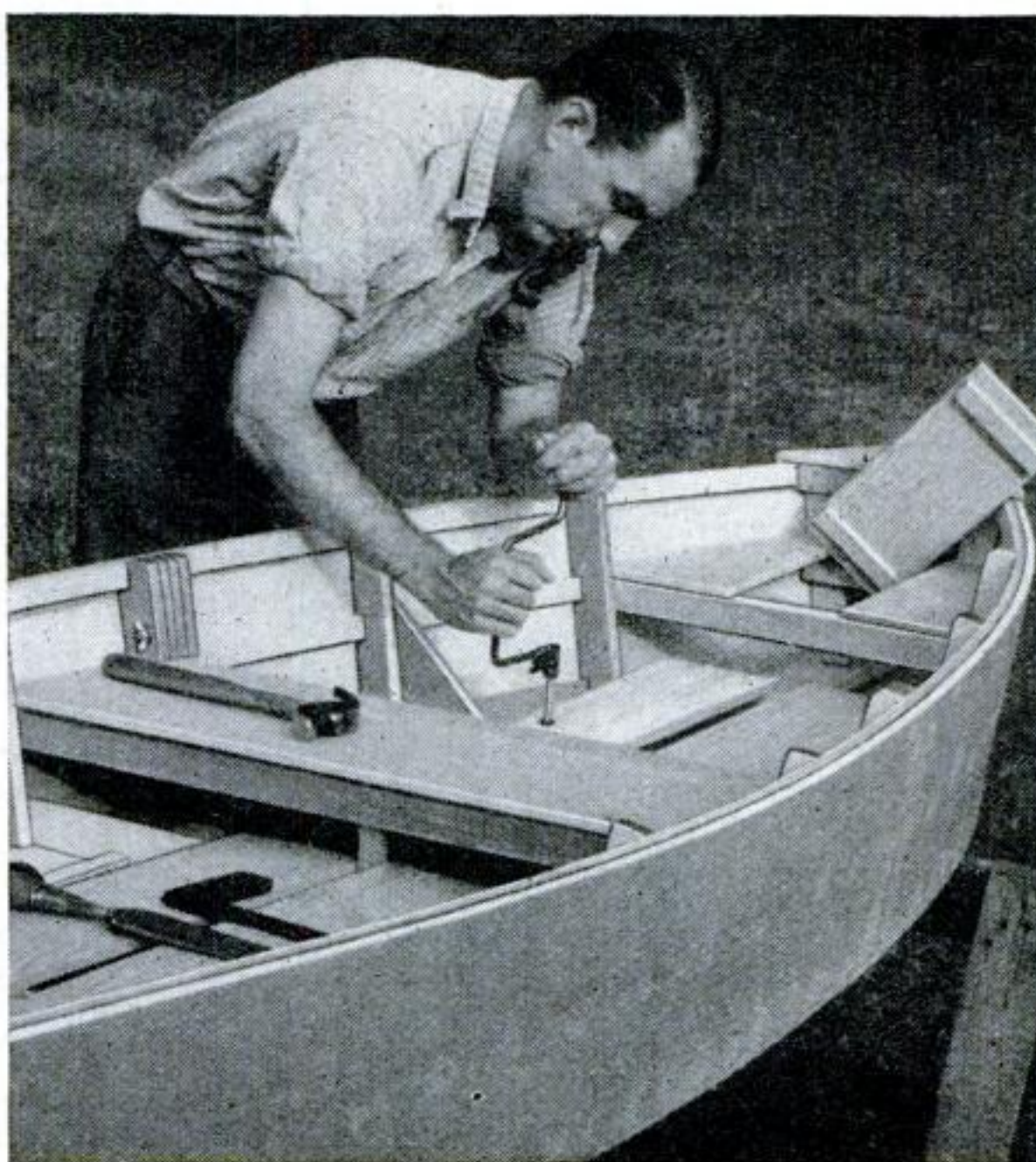
Make the rowing seat

and bow seat from  $\frac{1}{2}$ -in. material and fasten to a special framework as indicated in the drawings. The center of the bow seat can be made removable, thus providing access to a stowage space. The rear seat is simply a  $\frac{3}{4}$  by 8-in. piece which rests on seat rails.

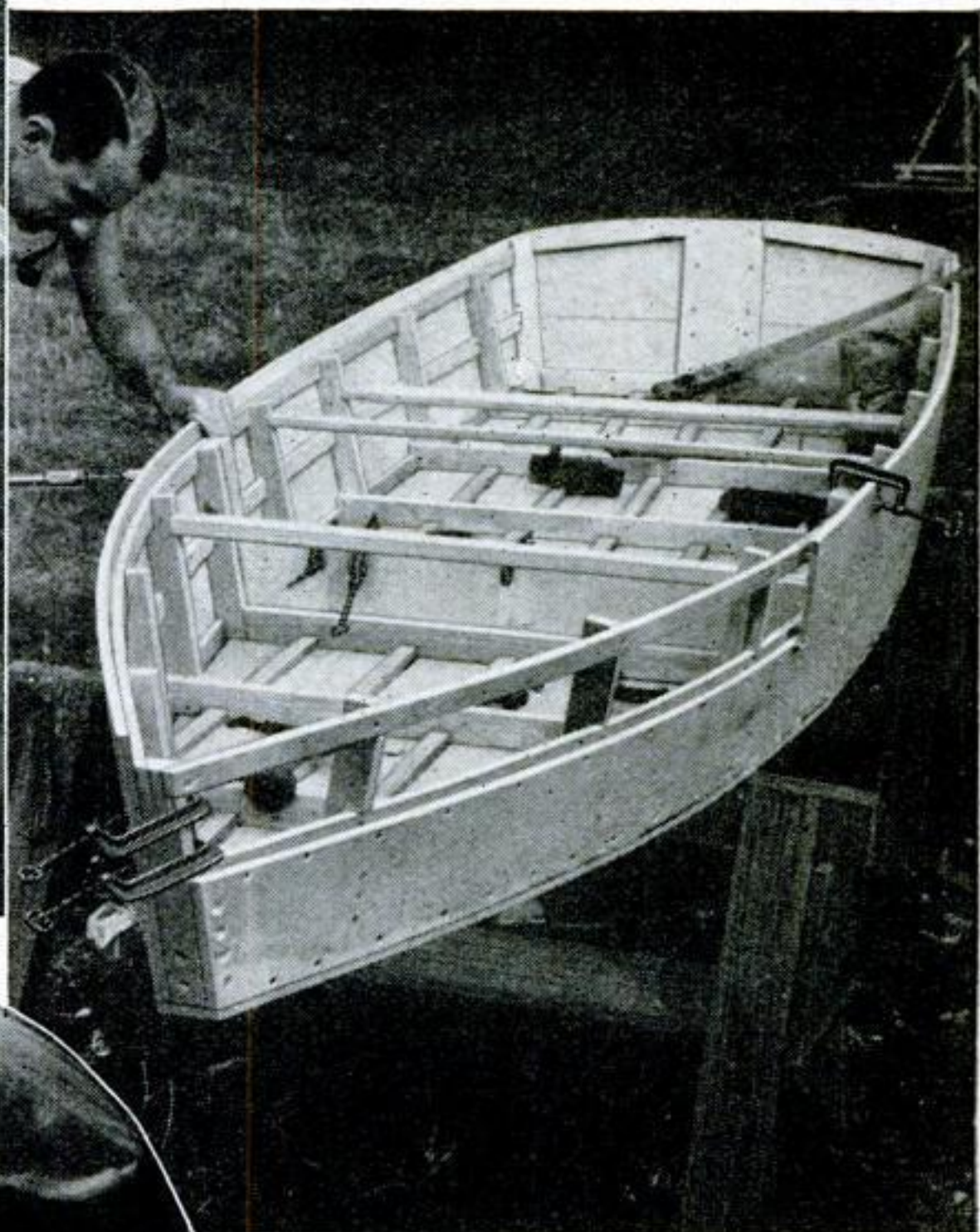
Knees on frame No. 3 are necessary to hold the sides in a true curve. The outside keels are screwed through to the inside keels, using  $1\frac{1}{4}$ -in. No. 7 screws. Then screw the oarlocks to the sheer batten with  $1\frac{1}{4}$ -in. No. 10 screws. Clamp and screw the half-round sheer molding to the planking and sheer bat-

ten with  $1\frac{1}{4}$ -in. No. 7 oval-head screws.

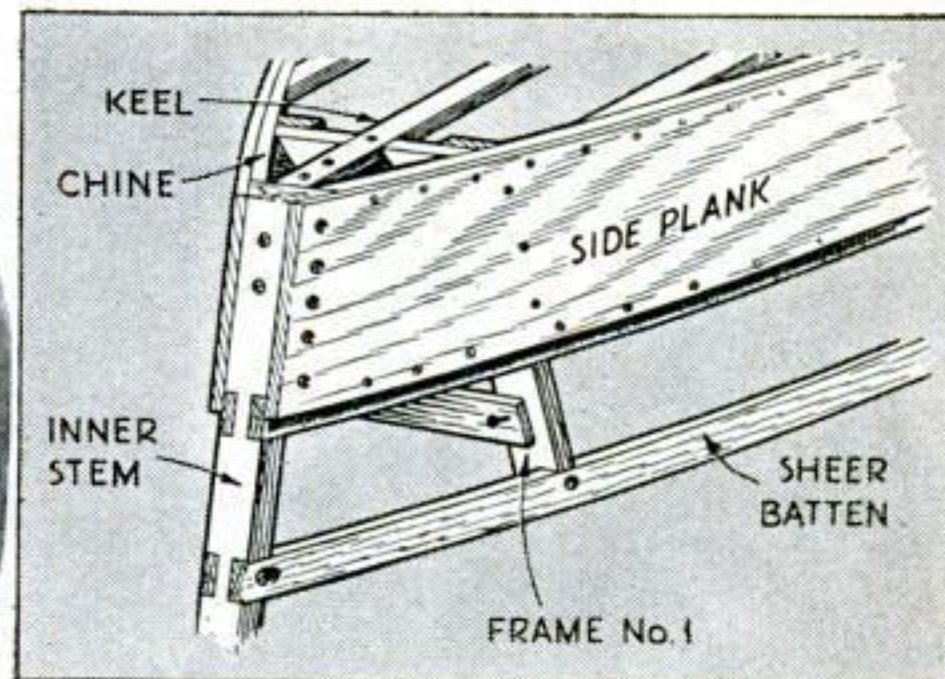
Sand the outside well and give the hull two coats of paint. Finish with marine enamel or with flat paint followed by a coat of spar varnish.



Floor boards are fastened with only a few screws. The center of the bow seat can be made removable, providing access to the stowage



The side frames have to be temporarily forced apart so they will be held until the seats and knees can be put in place



Above, sketch showing how the bottom side planks are fastened. Left, the half-round molding should be clamped in place before it is finally fastened



## New Game Flips Disk When Lever Is Pressed

IN PLAYING this entertaining game, a small red cardboard disk is placed in a hole in the game board, where it rests on a piece of thin metal. The lever projecting from one side is then pressed. This flips the cardboard disk nearly a foot into the air with a sharp pop.

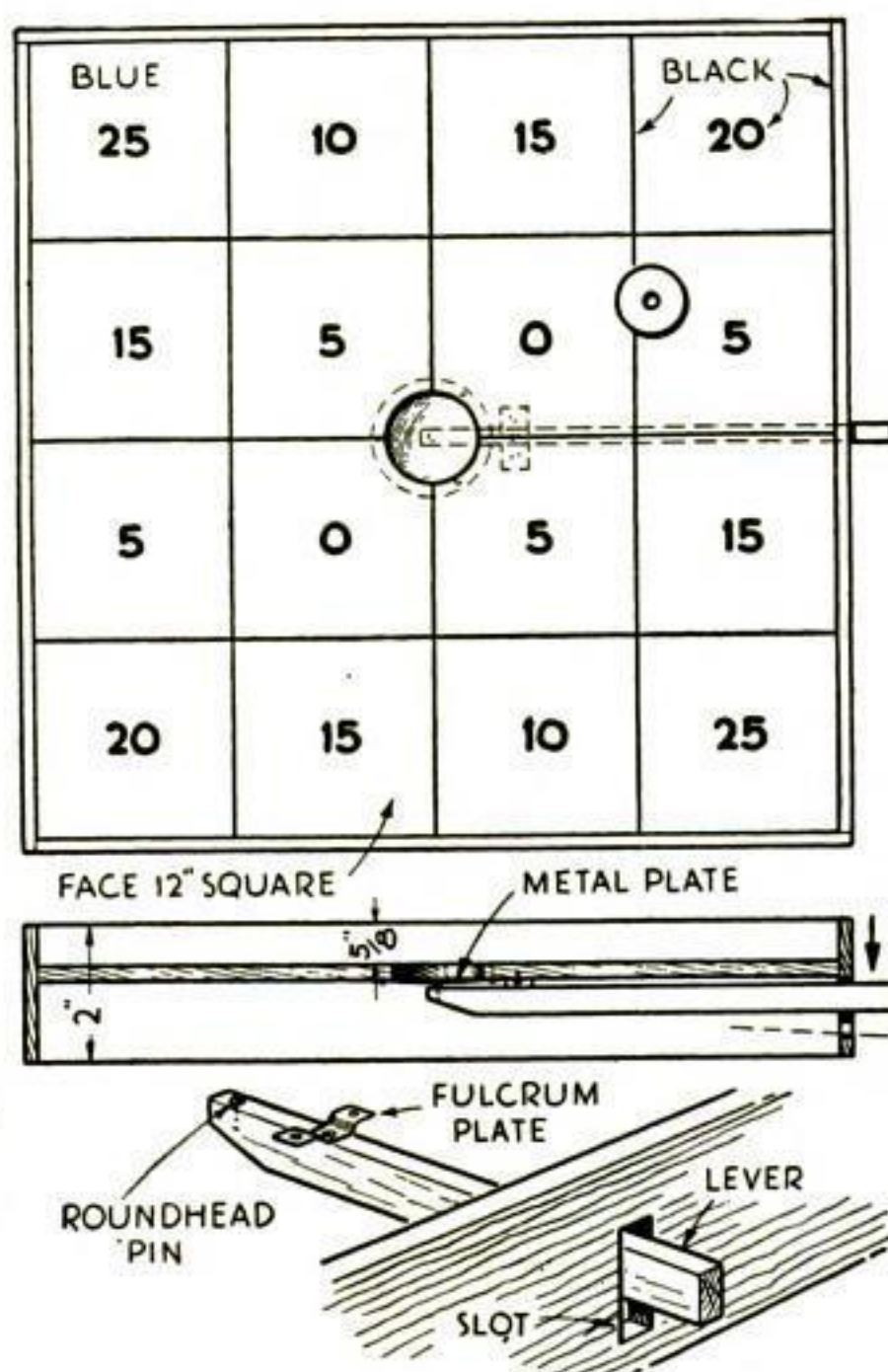
The score made by each play depends upon the number of the square in which the disk lands. If it falls in such a way that the central hole in the disk is over a line, so that the line can be seen through it, the play does not count, and an extra turn is allowed. Should the disk fall back into the hole, no score is made. To reset the metal plate, take hand off the lever and press down center of plate with a finger.

Only nine simple parts are required.



Players take turns popping the disk and score according to the square on which it falls

In attaching the metal plate under the  $1\frac{3}{8}$ -in. hole in the board, make the holes in the plate oversize and leave play under the nailheads. Similarly, in fastening the fulcrum plate, do not screw it tightly to the lever. Make the final adjustments by hammering down the center part of the plate until it flips the cardboard disk into the air properly.—DONALD W. CLARK.



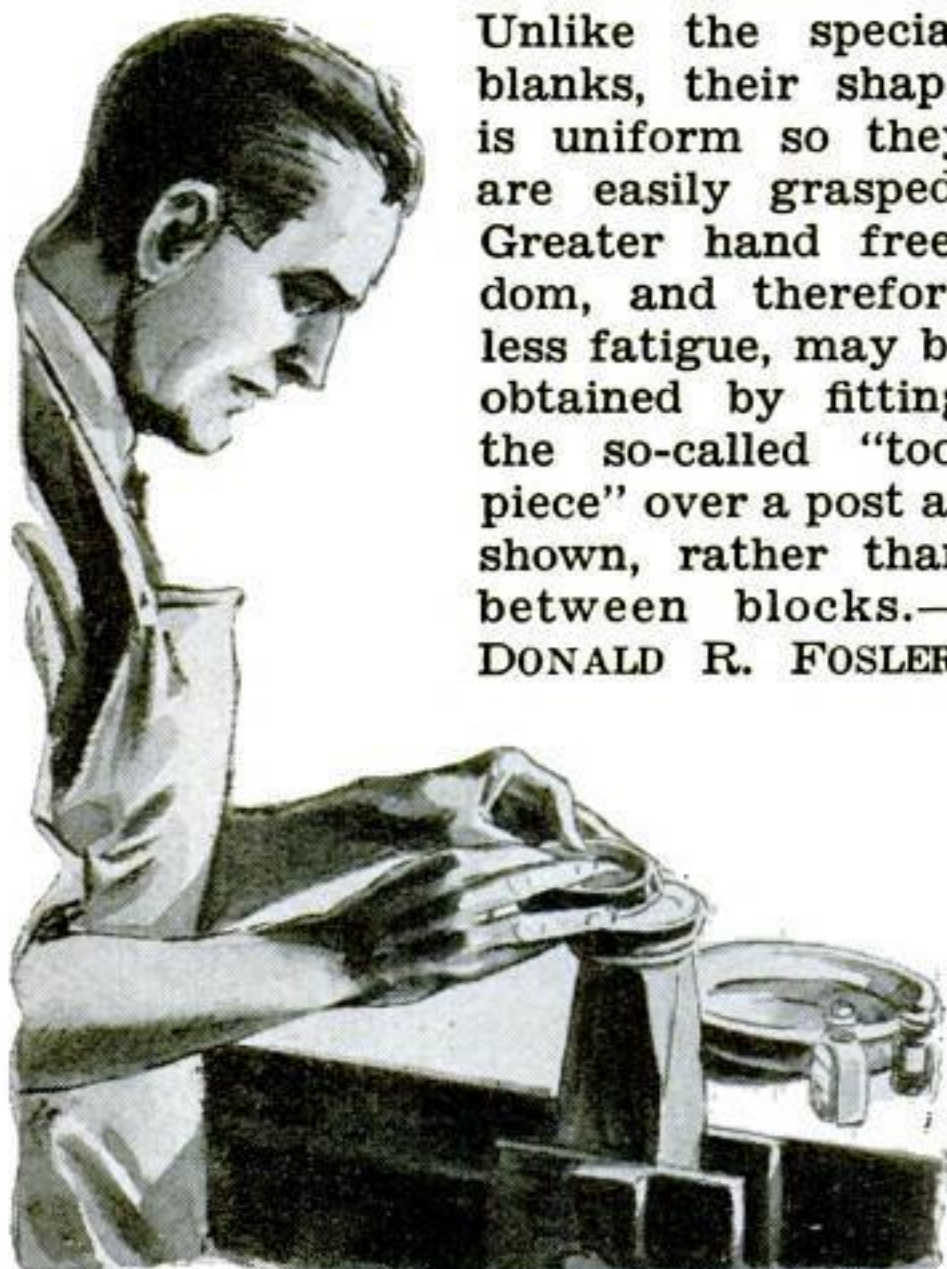
## Heavy Steel Clamp Acts as Emergency Wrench

WHEN tightening or loosening large pipe fittings or machine parts, a mechanic often discovers that he does not have a wrench of sufficient size to fit the work. A heavy steel clamp makes a good substitute in such instances. Fasten the clamp in position, leaving enough space so that a rod or bar can be slipped through, as illustrated above. The rod serves as a handle and gives suitable turning leverage.—O.R.S.

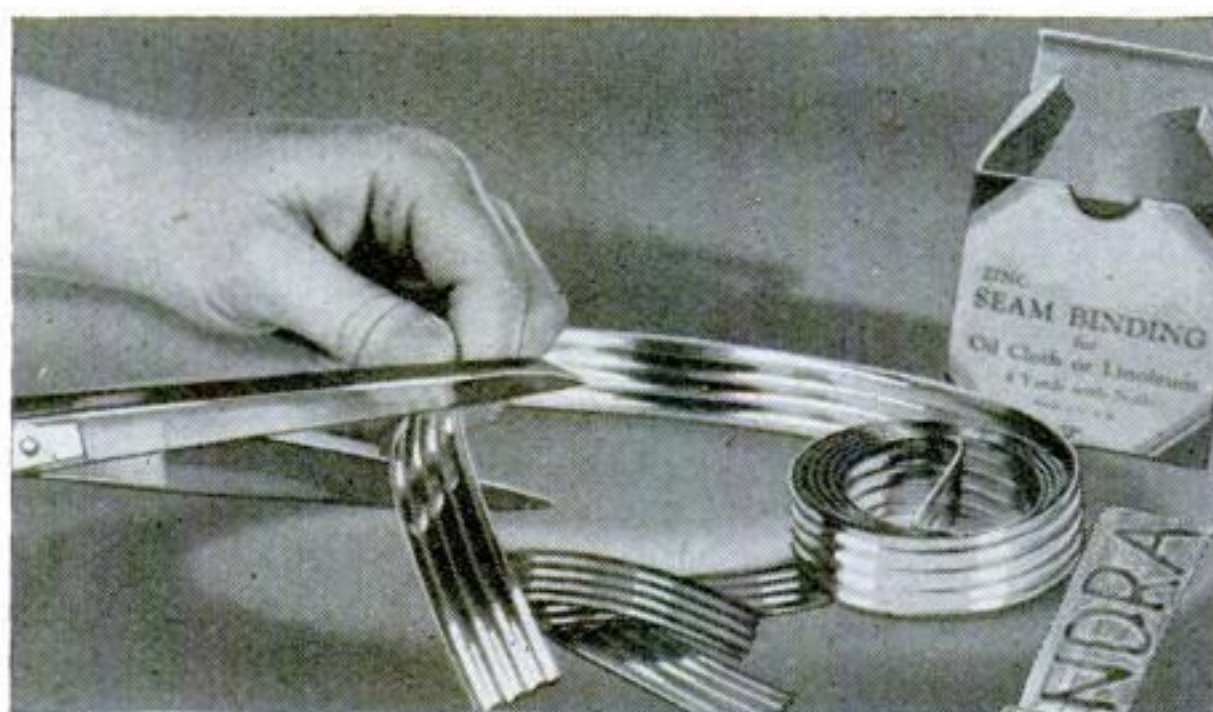
## Glass Caster Cup Used for Telescope Mirror

AFTER I had paid a good price for poorly made glass blanks to make small reflecting telescopes, I discovered that ordinary large size (4-in.) glass caster cups were more practical and less expensive. They are usually priced

at ten cents each. Unlike the special blanks, their shape is uniform so they are easily grasped. Greater hand freedom, and therefore less fatigue, may be obtained by fitting the so-called "tool piece" over a post as shown, rather than between blocks.—DONALD R. FOSLER.



By mounting the "tool piece" over a post, the grinding is accomplished more easily

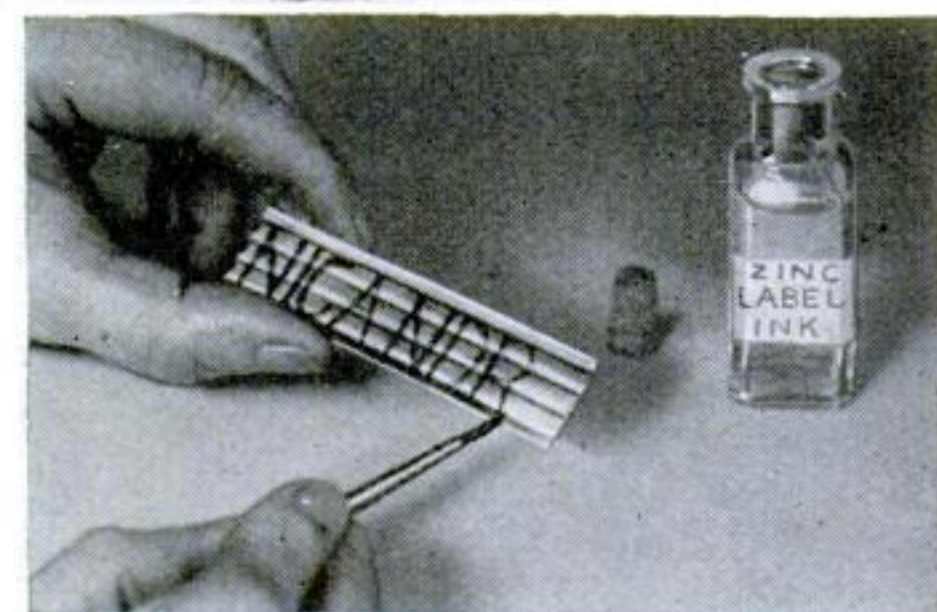
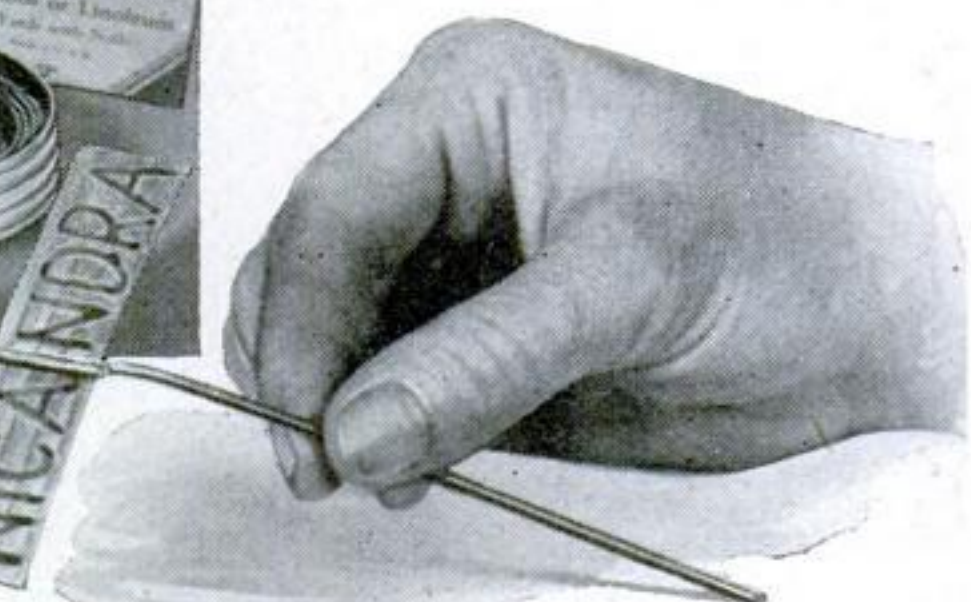


## Durable Plant Labels Cut from Linoleum Seam-Binding Strips

INEXPENSIVE and permanent garden labels for marking seed beds and garden plants can be quickly made by cutting off 3-in. lengths of the zinc seam binding that is used in laying linoleum. The ink for writing on the zinc is a solution of copper sulphate or bluestone. It can be prepared in practically any strength, but should be fortified with about half a spoonful of muriatic acid to several ounces of the solution in order to give a better "bite."

Apply the writing solution on the metal slips with a small water-color brush. A stiff piece of galvanized wire is bent at one end and crimped onto each label as shown with pliers to provide a leg for sticking in the ground.

The zinc seam binding is cut into lengths of about 3 in. and lettered with a special ink. A galvanized-wire leg is added to each by crimping it around as illustrated below



For lettering, a solution of copper sulphate fortified with muriatic acid is used

These labels are waterproof. The name can be erased for reuse by heavy sandpapering, or the reverse side can be written on.—R. W.



# GUNS FOR THE 'ALABAMA' Model

By Capt. E. Armitage McCann

**A**RMING our *Alabama* model\* is the interesting task ahead of us this month. Although she captured many vessels without firing a shot, it was the threat of her guns that made the famous Confederate commerce raider the scourge of the seas for two years during the Civil War and enabled her to capture nearly seventy Federal vessels.

There are still some details of the deck to be added, so it will be just as well to get these out of the way before making the guns. In this work, refer to the deck plan published last month.

The hatches are frames of  $\frac{1}{8}$ -in. wood, rabbeted to take the grating. They are black, with teakwood-colored gratings.

The propeller hatch (see drawing, P.S.M., Mar. '38, p. 88) is similar to the others in general construction, but covered with a solid piece, divided in two lengthwise and with a hole for the chain to pass through.

On the poop there probably was a skylight. This I made to represent six triangular glasses with dividing bars.

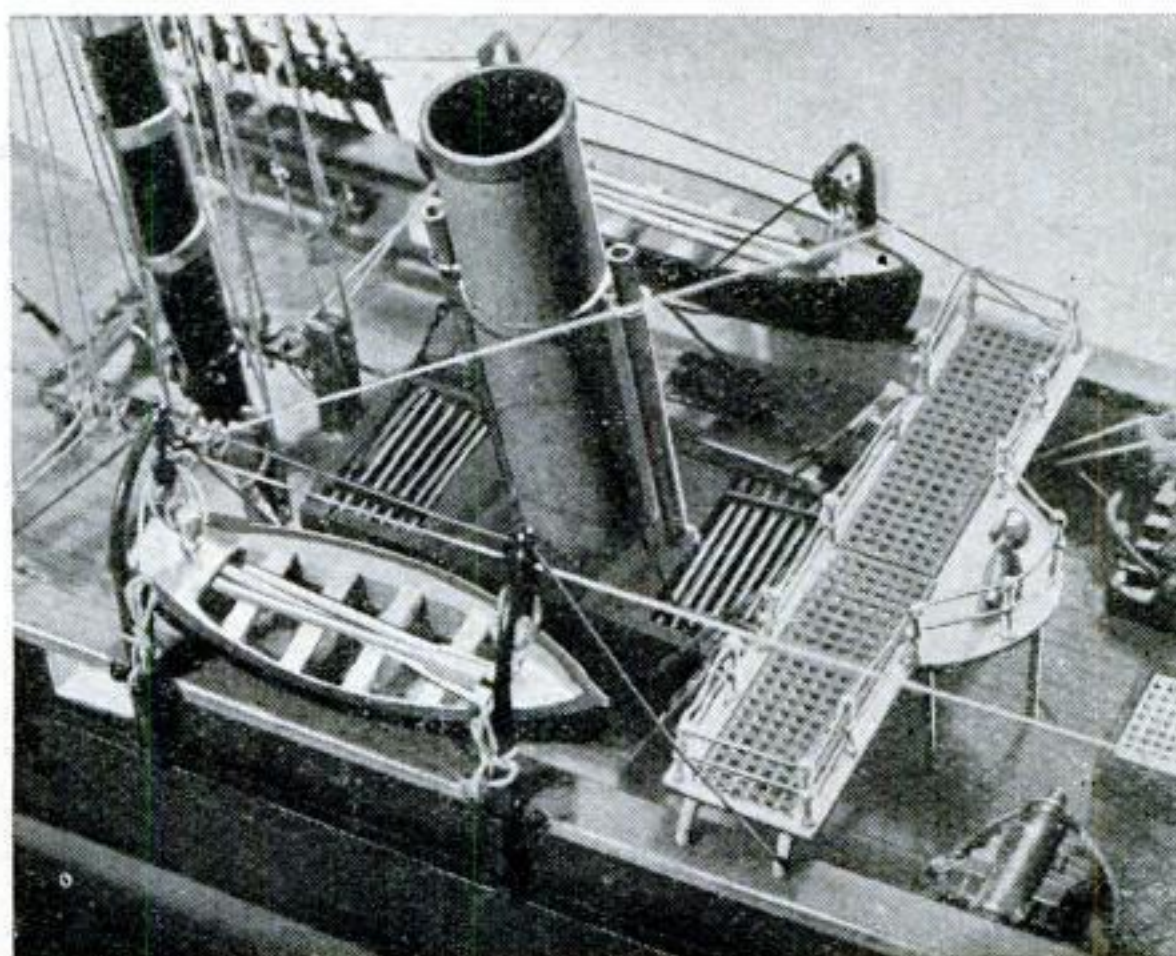
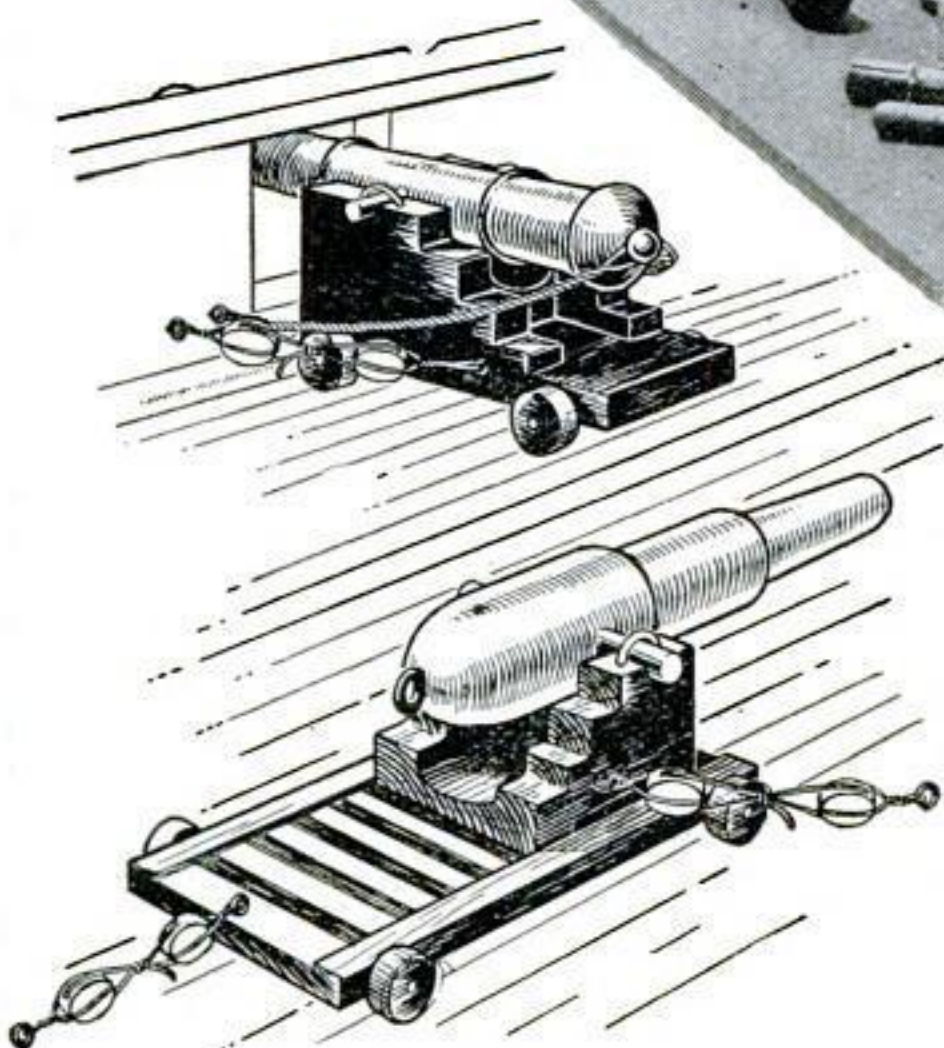
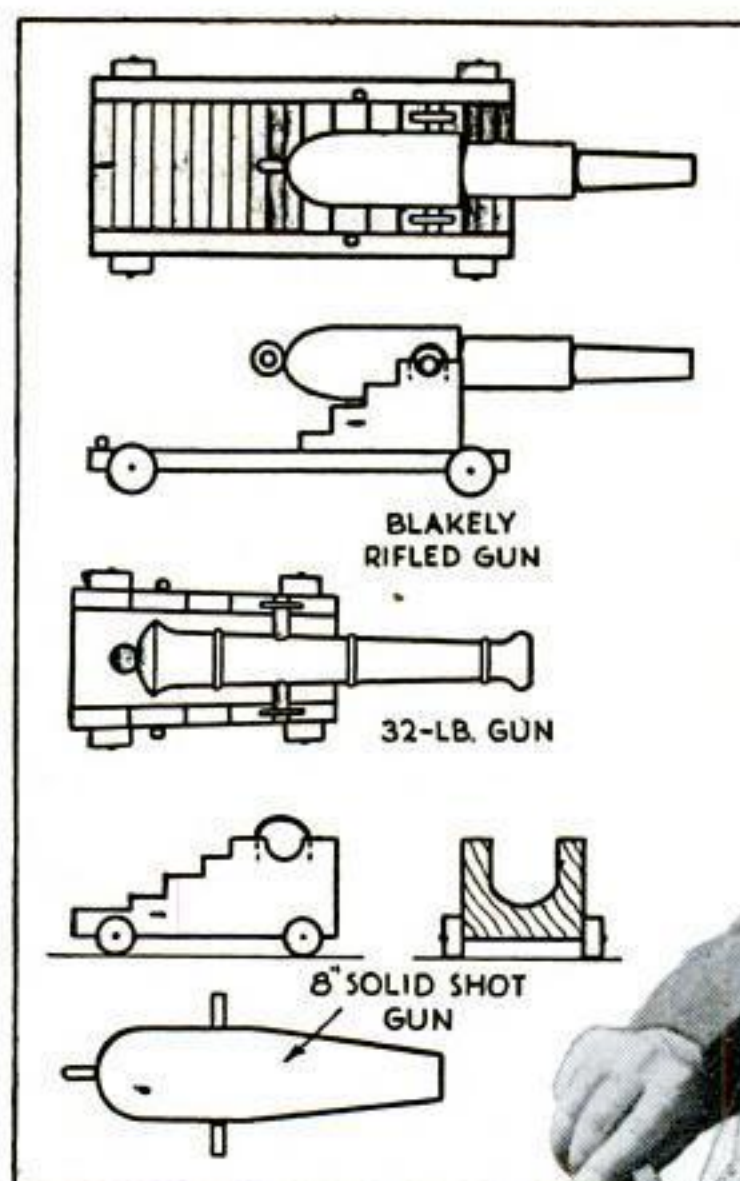
There are two steering wheels joined to a barrel for the wheel chain and set on iron standards. The wheels should be  $\frac{1}{2}$  in. in outside diameter and as thin as possible. The standards can be cut from fiber board or metal, and the legs sunk into the deck. A small chain is wound a couple of turns around the barrel, and the ends are stuck into holes in the deck.

\*This is the fourth in a series of articles on the construction of a scale model of the *Alabama*. See P.S.M., Feb. '38, p. 77, Mar., p. 88, and Apr., p. 83.

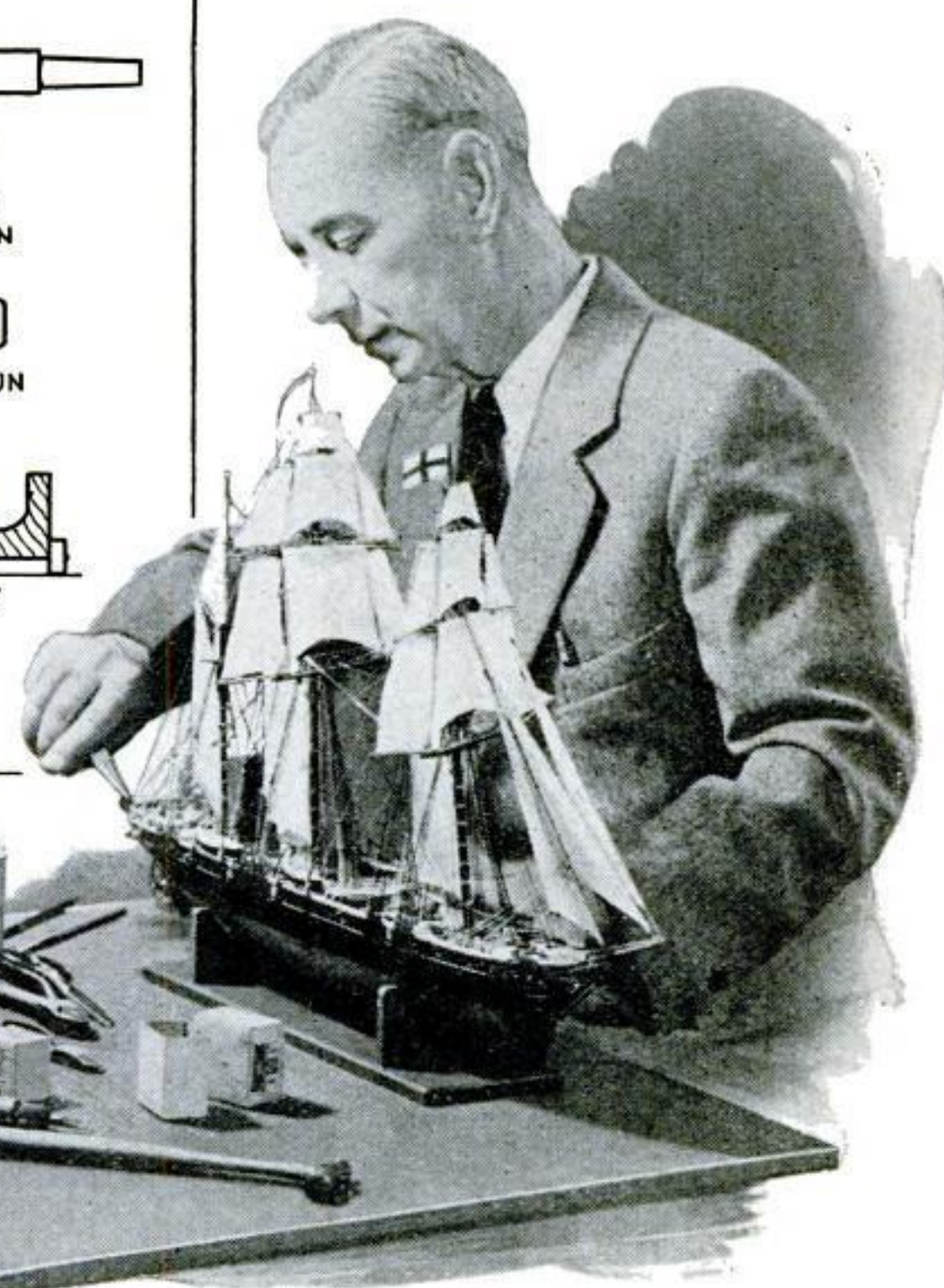


Full-size detail of boat davits. The ones at the stern, illustrated at right, are a trifle shorter

The three types of guns appear full size above. The 8-in. gun has a carriage like the Blakely gun



Bridge, funnel, and two of the boats hanging in davits. Below, the big capstan



How the model looks when completed. It is 28 in. long and 16 in. high over all

Between the assembled steering wheels and the adjacent hatch there is a compass binnacle. The top is filed from a piece of brass and set on a wooden base.

On the forecandle is a large capstan connected with the windless below. This is carved or turned in the usual way from a piece of wood.

The bell at the break of the forecandle (see drawing in the March issue, page 88) is about  $\frac{1}{8}$  in. high. I hung it on an ornamental bent-wire bracket, the ends of which are stuck in the deck.

Around this deck from cathead to cathead are stanchions and rails, and there are two ladders, all similar to those for the bridge. These were illustrated last month.

Iron bitts are set on either side of the forecandle deck. These are best bought ready-made or cast from white metal, but they can be built up from wood or metal, if preferred.

The poop deck has a teakwood rail around it, set on turned wooden stanchions. I jig-sawed the rail to shape in one piece from  $\frac{1}{16}$ -in. plywood, except across the front, where three straight pieces of the same material are required.

Ladders lead to this deck, and it has mooring bitts on each side. At each forward corner are pinrails set firmly (Continued on page 106)

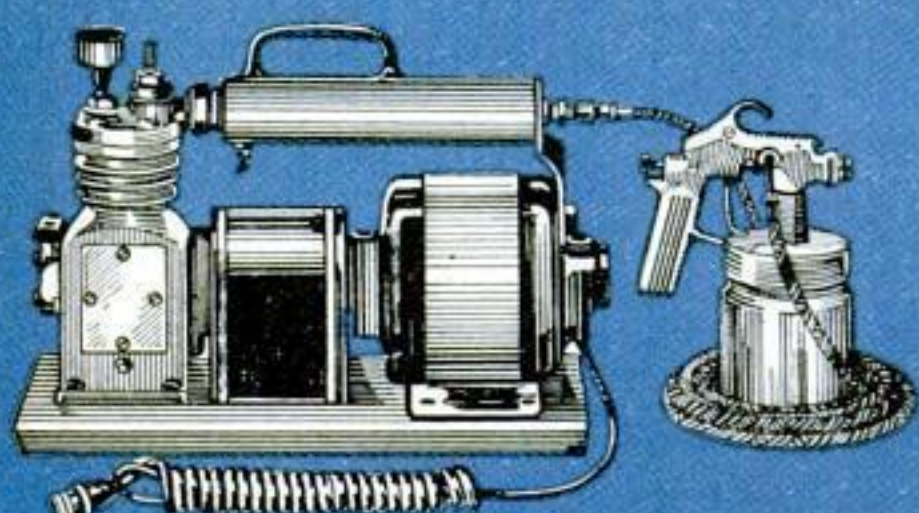
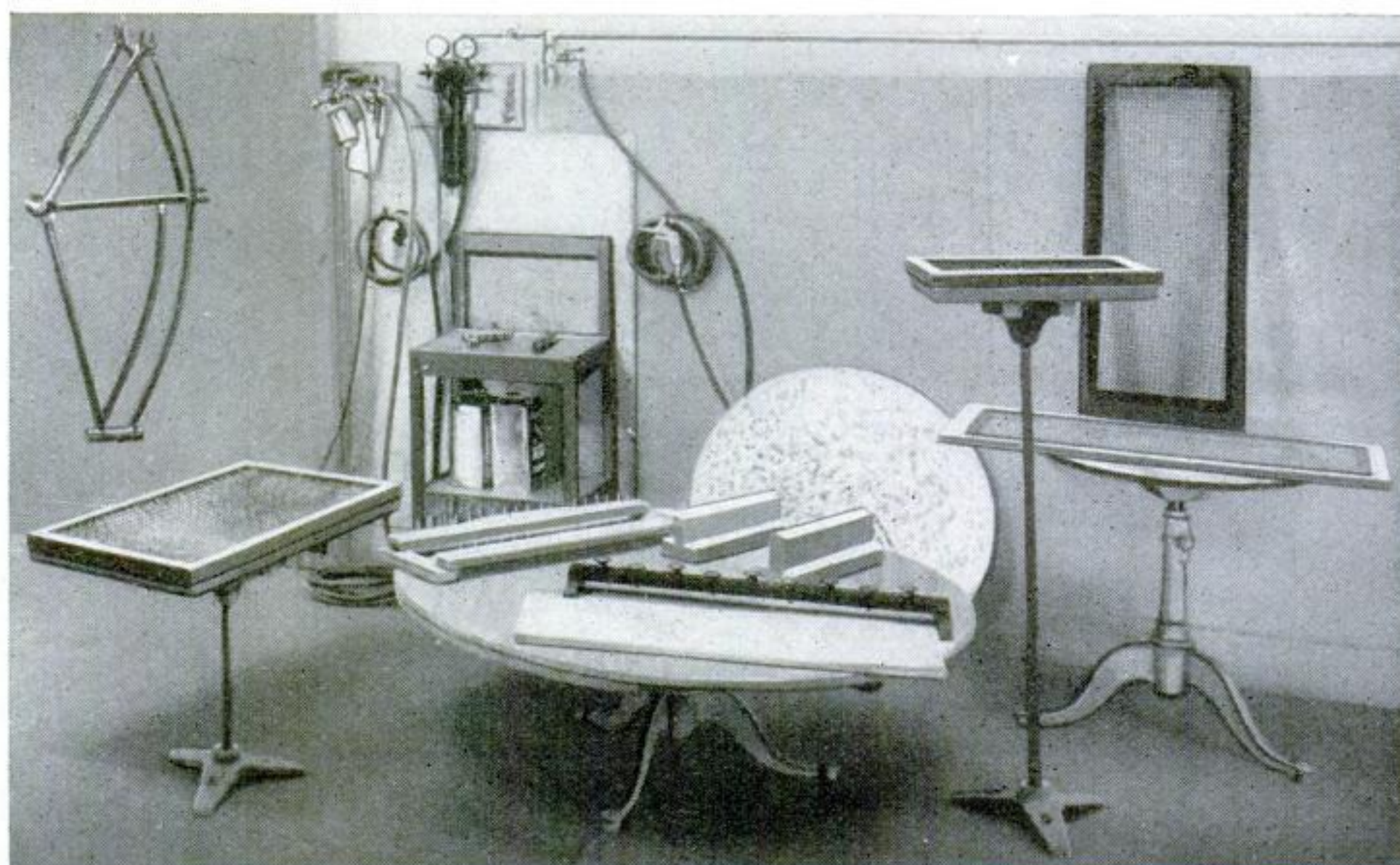




# Better SHOP Methods

## Choosing a Paint Sprayer

Efficient paint-spray equipment is shown at the right. Note the stands of various heights with interchangeable wire tops and the spray tables with tops to fit high or low bases



Direct drive portable spray outfit with air transformer and pressure regulator



A considerably less expensive outfit with V-belt drive. This is a type excellent for home workshops



Semicommercial unit for the garage and refinishing shop with 100-lb. air pressure

By  
RALPH G. WARING



**N**OW that furniture, automobiles, shop equipment, and household utilities are so generally finished with the spray gun, the question of installing a paint-spraying outfit is of increasing and often of very pressing importance to the owner of a small shop, as well as to amateur mechanics who have well-equipped home workshops.

A suitable space in which to work is, of course, the first requirement. It must be easily accessible and so arranged that the largest piece of equipment or furniture can be brought through adjacent doors without difficulty. It should have as much natural lighting as possible, together with good electrical service.

Some means of forced ventilation is desirable, either by installing a suction-type fan or by exhausting the fumes into a water spray and thence into the sewer. Rebuilt equipment or second-hand outfits for this purpose can be purchased at reasonable prices.

The spray booth itself should

Furniture and other fairly large pieces are set on a turntable for spraying. The inside and out-of-the-way parts are sprayed first



be about 6 ft. high, 8 ft. wide, and from 5 to 6 ft. deep, depending on circumstances. If most of the work is to be done in winter, some source of heat should be available for drying the finishes.

The man who does a good job of installing his spray booth and lines it either with sheet metal or with building board composition, coated with water glass for fireproofing after erection, will be better satisfied in the long run. In addition, he will be in a better position to take in outside work, if necessary, as a means of paying for the installation and equipment.

With the spray booth and attendant exhaust problem satisfied, we are next concerned with the spray machine itself. Remember that good spray equipment, properly taken care of, is a lifetime investment. By all means avoid the types that attach to a vacuum cleaner or to auto-engine cylinders in place of a spark plug; also those spray guns which have a motor and spray head in a one-piece assembly, as this design is too heavy and awkward to be practical except in the hands of a giant.

Three typical outfits are shown in accompanying drawings. The first is a direct-drive portable outfit, priced at about \$70. The second is a portable outfit with V-belt drive which is well adapted for the home workshop. It costs complete about \$40. The third is a semicommercial unit for garages or refinishing shops where air pressure at 100 lb. and from 8 to 10 cu. ft. per minute is available. It is standard equipment for lacquers and synthetic finishes.

Any equipment must have both an air transformer and a pressure regulator and gauge. The air transformer effectively strips oil and moisture from the compressed air and delivers it dry and clean to the gun. The pressure device enables the correct poundage to be used on the gun to suit the kind and viscosity of the material being sprayed.

The gun itself is of the utmost importance and should not be purchased from any but a first-class manufacturer, and then only when its requirements in relation to the compressor are clearly understood.

Some guns operate efficiently at 4.3 cu. ft. per minute and under 25 to 35 lb. pressure. Others require as many as 7.2 to 9.7 cu. ft. per minute at 55 to 65 lb. pressure, or even 100 lb. Obviously, it would not be wise to buy one of the lat-

ter at any price, no matter how small, if the compressor does not have a capacity over 6 cu. ft. per minute at 50 lb. pressure. Whenever possible, buy a complete unit as made by one manufacturer.

Again, an adequate gun should have suitable adjustments whereby the spray is changed from narrow to wide, and flat to round without any need of taking the gun apart. It should be light and small to facilitate quick manipulation on small areas or parts—not heavy and clumsy. It must be easily cleaned, oiled, and reassembled.

The handle or stock should be a solid forging, formed to fit the hand and free from corrosion when cleaned in standard solvents. Of equal importance is the design of the trigger and whether it is a one-, two- or three-finger control. If much work is to be done, this item has considerable bearing on hand fatigue. A small gun of 4- or 5-in. spray stroke will have but one finger control, but guns of greater width and cup capacity will vary.

When accessory equipment is considered, at least two 25-ft. lengths of braided air hose, complete with fittings, should be on hand. The air duster, a small, pistol-like device with a finger valve, is worth while for cleaning off work just previous to the application of any finish. It is far superior to the usual round, mule-hair duster, and as a matter of fact should be used with it.

For handling chairs, tables, dressers, and other large work, spray-booth turntables are a necessity. These should consist of heavy wooden or cast-iron bases, with a central bolt of adequate size on which the removable top can be dropped to turn freely without wobble. Those shown were made from obsolete drawing-table bases picked up in a junk yard. The 2 by 4-in. hardwood cleat, screwed flat under the top, was built up to about 4 in. in the center

and then drilled to fit a  $\frac{3}{4}$ -in. piece of pipe bushing, which in turn gave an adequate fit on the  $\frac{3}{4}$ -in. bolt fastened to the base casting. The top of the table was covered with galvanized sheet iron to give long wear and to insure easy cleaning.

From time to time useful accessories will suggest themselves, especially tight-drawn wires and hooks for many small parts; a portable drying rack with variable slip rods to accommodate large and small panels; spray stands with  $\frac{1}{2}$ -in. wire cloth frame tops to facilitate clean, fast spraying of small parts, without rehandling until dry; boards with nails to elevate work above the spray table, and spray-table blocks with beveled top edges for heavy work.

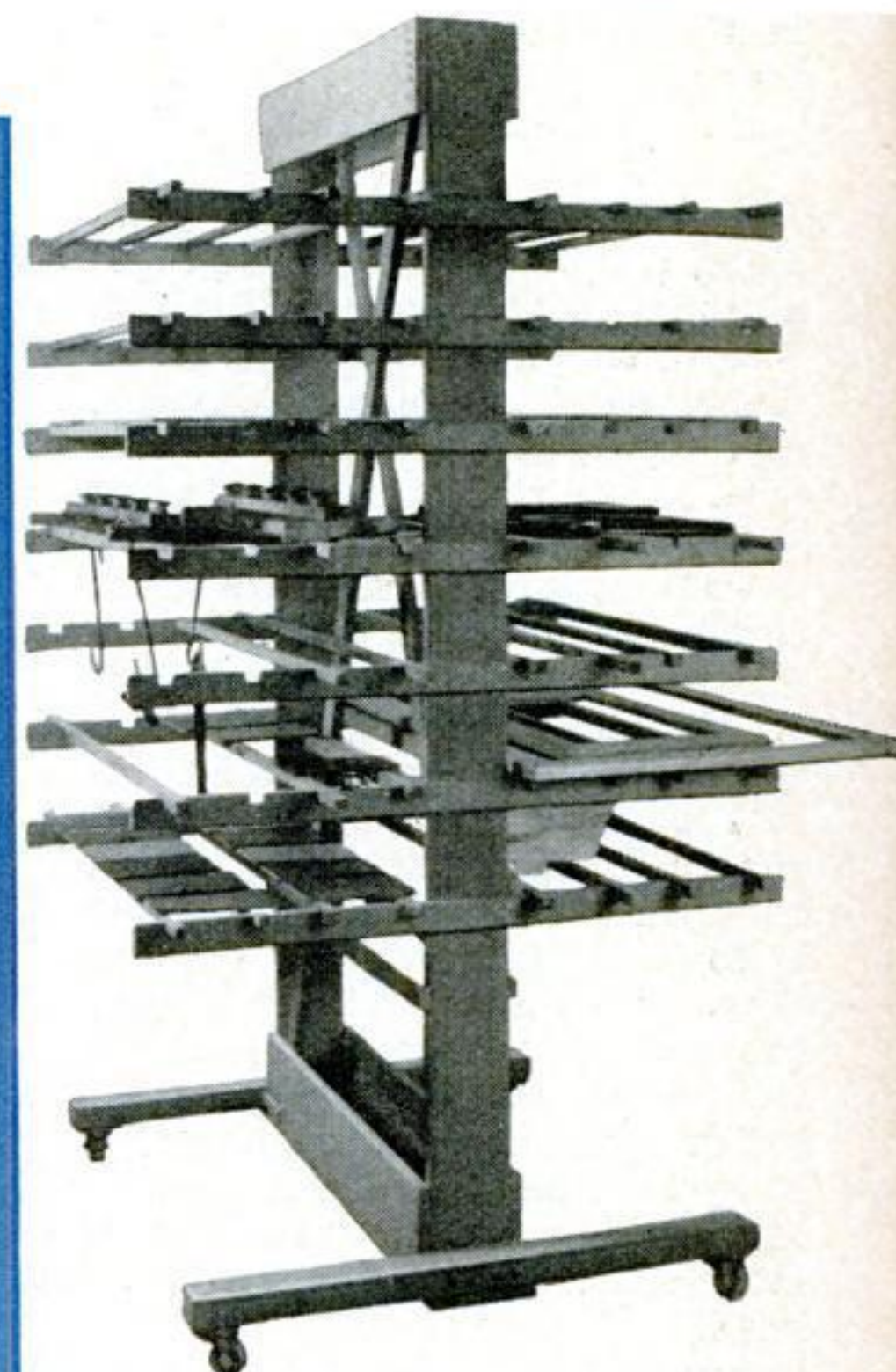
In a following article, tricks of the trade, operations, and methods will be discussed in detail.



Spraying a frame on a wire-topped stand



An air duster used to clean work prior to spray coating. It is far better than a mule-hair duster



Portable spray rack designed to hold a large variety of work. Note that the arms are notched to receive the rods, which are loose and interchangeable



# ATTACHMENTS FOR THE Oxyacetylene Cutting Torch

**W**HEN the oxyacetylene cutting torch is held free-hand, every heartbeat, breath and involuntary twitch is recorded in the cut, but this can be avoided by making the simple attachment illustrated at the right.

First, a bushing is required with an outside diameter  $\frac{1}{4}$  in. larger than the largest tip, and bored to fit the tip used for average work.

The next requirement is a yoke made from a piece of  $\frac{1}{2}$ -in. mild steel plate, bored to fit the outside of the bushing and with one side split and drilled so as to clamp the bushing in the yoke and at the same time hold it rigidly on the tip. The other side of the yoke has a boss left on, and this is drilled and tapped for a  $\frac{3}{8}$ -in. rod. In fact, we use several rods, ranging from 3 to 13 in. in length.

From a piece of shafting a pivot is turned, pointed at one end, and drilled to take the rod in the center. It is drilled and tapped at the other end for a set screw to hold it on the rod.

Finally, there is a two-wheeled dolly, the body of which is  $\frac{1}{2}$ -in. plate, drilled to take the rod and a set screw to hold it on the rod. The wheels are about  $1\frac{1}{4}$  in. in diameter,  $\frac{1}{2}$  in. thick at the hub, and tapered to almost a sharp edge at the rim. They revolve on  $\frac{3}{8}$ -in. studs.

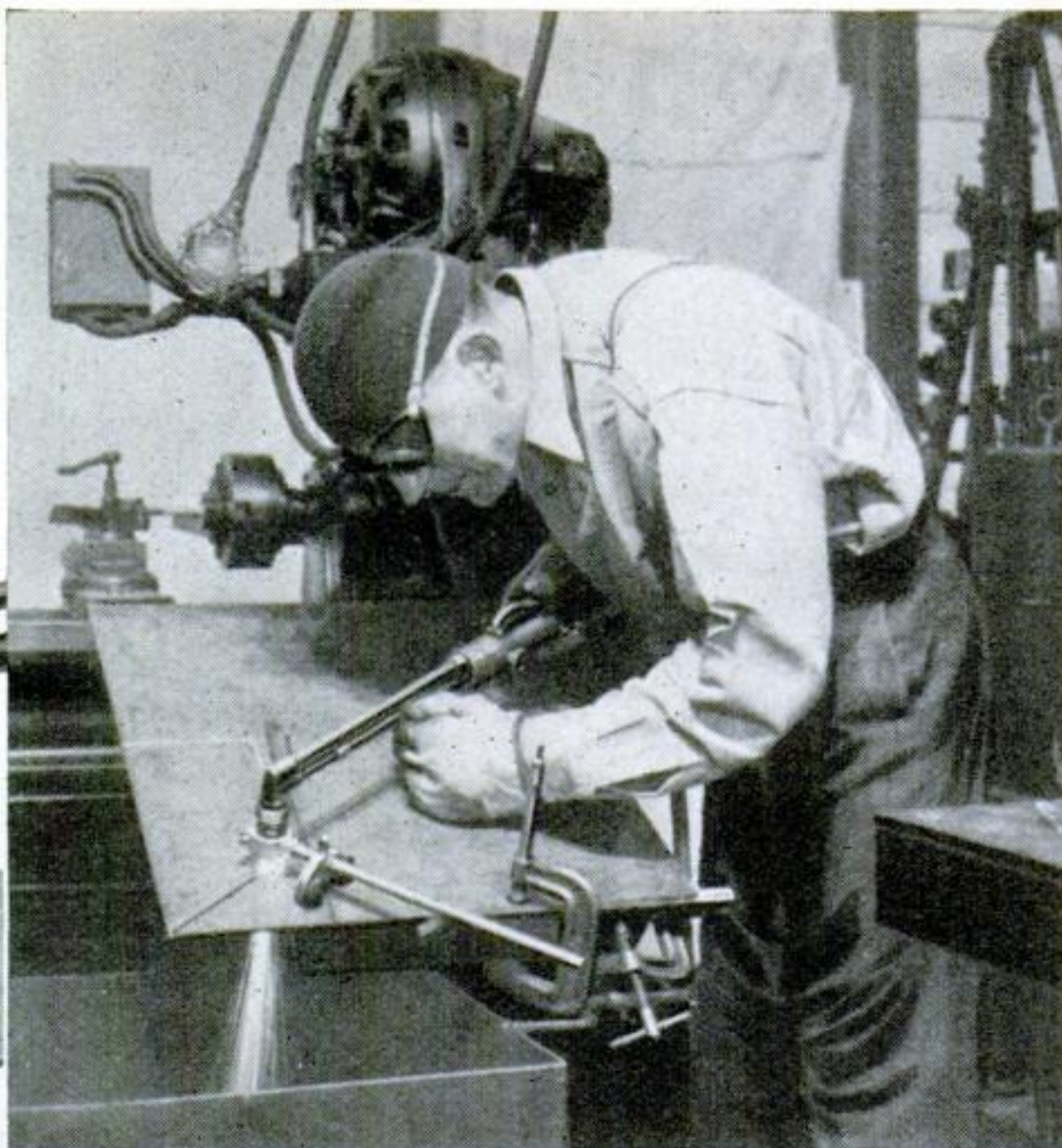
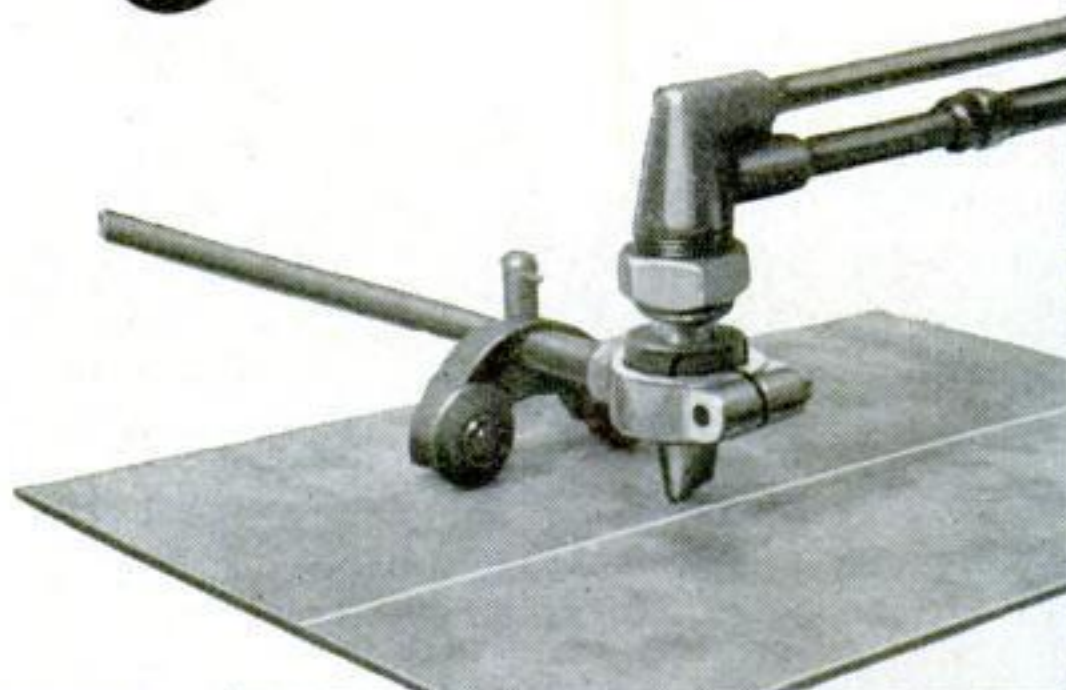
For cutting a circle, we place the bushing, yoke, and rod on the torch tip, and set the pivot on the rod so the distance from the center of the pivot to the inside edge of the cutting jet of the tip is equal to the required radius. All that is then necessary is to light the torch and cut the disk. If a large circle is needed, the dolly may be placed between the torch head and the pivot.

For following a straight or an irregular line, the dolly is placed on the rod and, if practical, a rod is used with sufficient weight to balance the torch head.

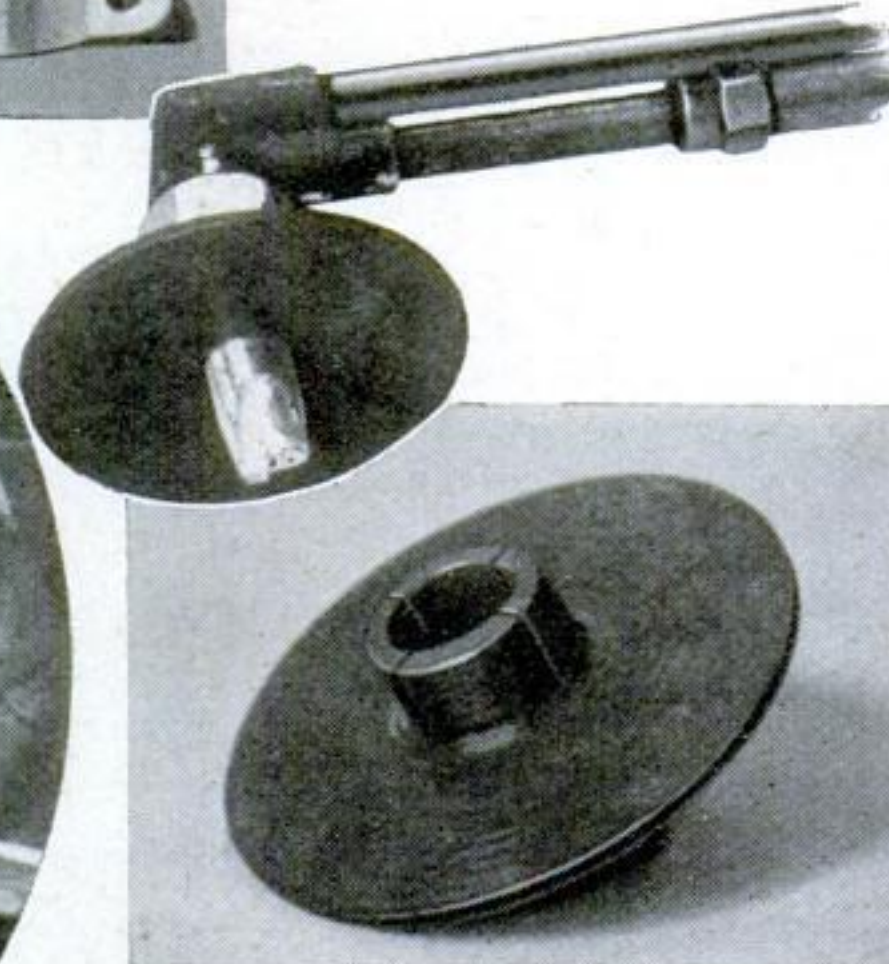
Another valuable accessory is a disk to protect the head of a cutting torch when used for punching holes or burning out rivets. This disk is made as shown from a piece of  $\frac{1}{8}$ -in. steel plate,  $2\frac{1}{2}$  in. in diameter. A piece of iron pipe

$\frac{1}{2}$  in. long is brazed on one side. The hole through the disk is slightly larger than the diameter of the tip. The pipe is slotted in four places after being brazed, and the sides are sprung in until they grip the tip sufficiently to hold the disk in place.—W. C. CHENEY.

*This is the fourth and last of a series of articles on oxyacetylene cutting. Next month, oxyacetylene brazing.*



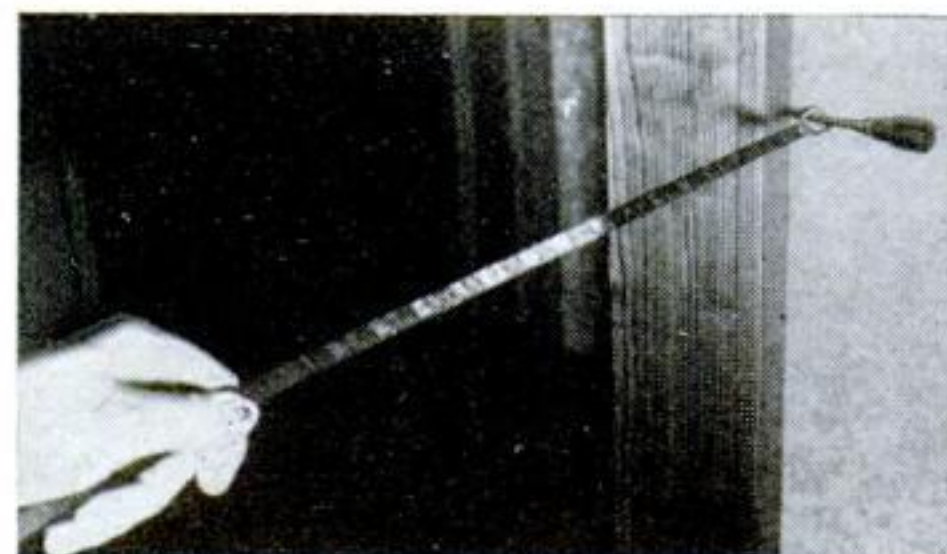
Above, cutting side plate for a bucket conveyor with the straight-line guiding attachment. At left, the members of the attachment



Front and back views of the disk used to protect torch head from the blowback when punching holes

## Measuring a Building Without Assistance

INTERIORS or exteriors of a building can be measured without an assistant by using a miniature screw driver to hold one end of the steel tape, as shown below. The screw driver is slipped through the ring of the tape and stuck in any available joint or crack.—J. S.

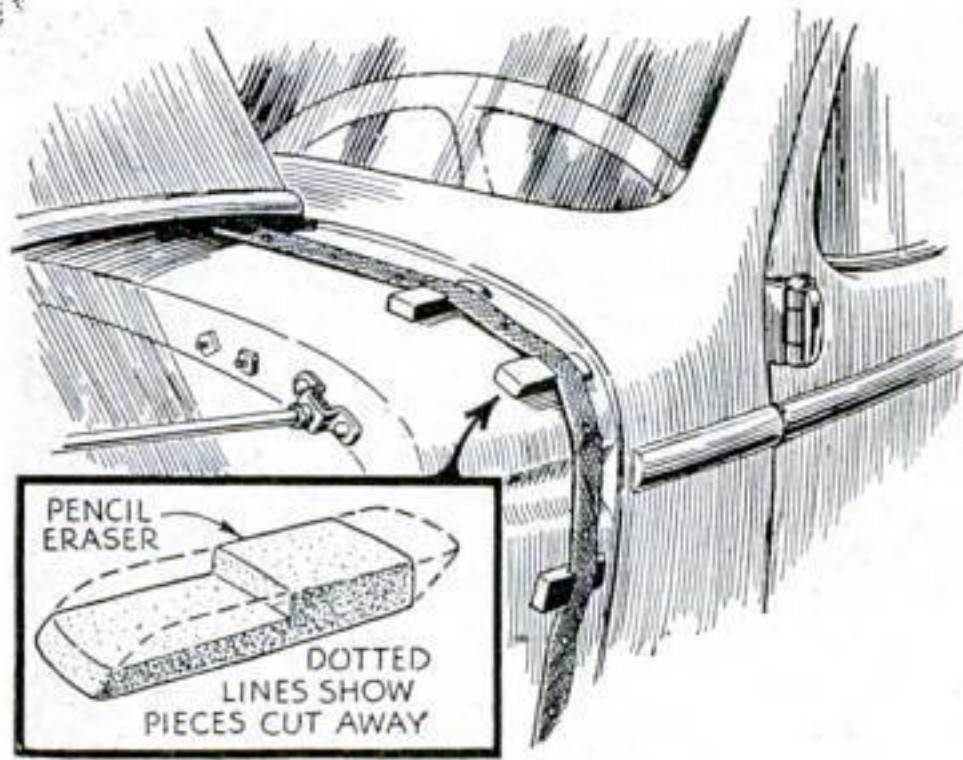


The end of the tape is held by a miniature screw driver, stuck into a joint or crevice

In circle, cutting a disk, and, directly above, the disk after being cut—to show quality of the work



# Six Novel Kinks for Car Owners



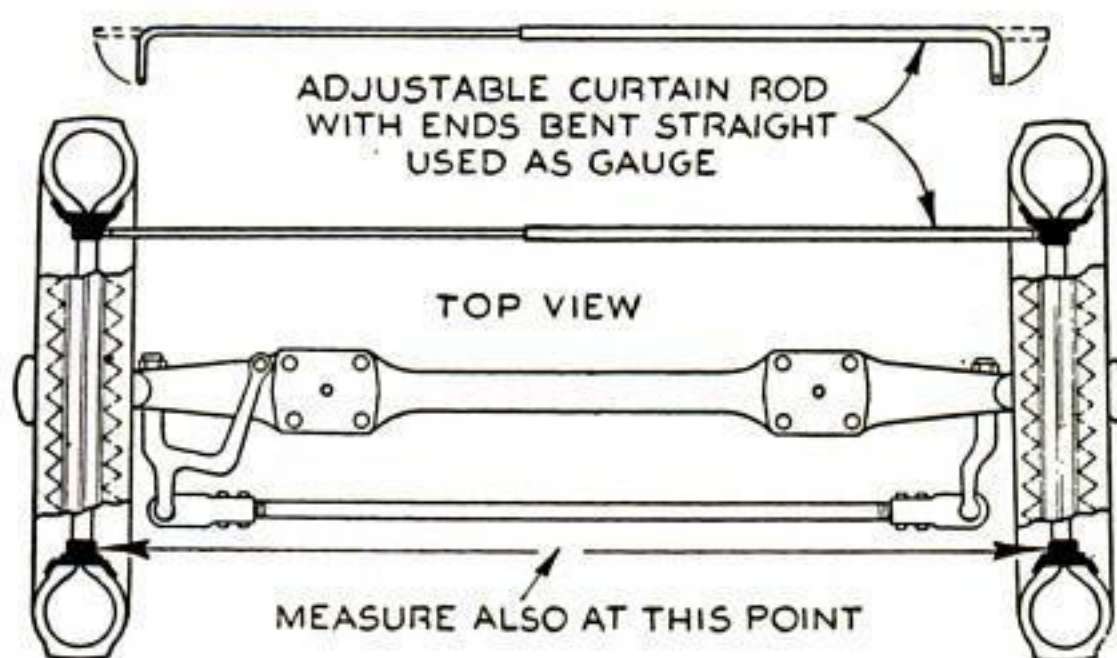
## Hood Silencers Made from Rubber Erasers

HOOD LACING that mats down and becomes hard with age often allows the hood to rub the body and cause annoying squeaks. Ordinary pencil erasers, notched as shown above and slipped under the lacing, will silence the noise. Pressure of the lacing is usually strong enough to keep the rubber silencers in place.—C. P.

## Tissues Useful in Car

PAPER cleansing tissues that many women use for removing cosmetics are a handy accessory for your car. A box of these carried in the dashboard compartment provides handy dusters for cleaning the steering wheel, wiping fog or insects from the windshield, and a number of other uses.—K. P.

## Curtain-Rod Gauge Measures Wheel Toe-In

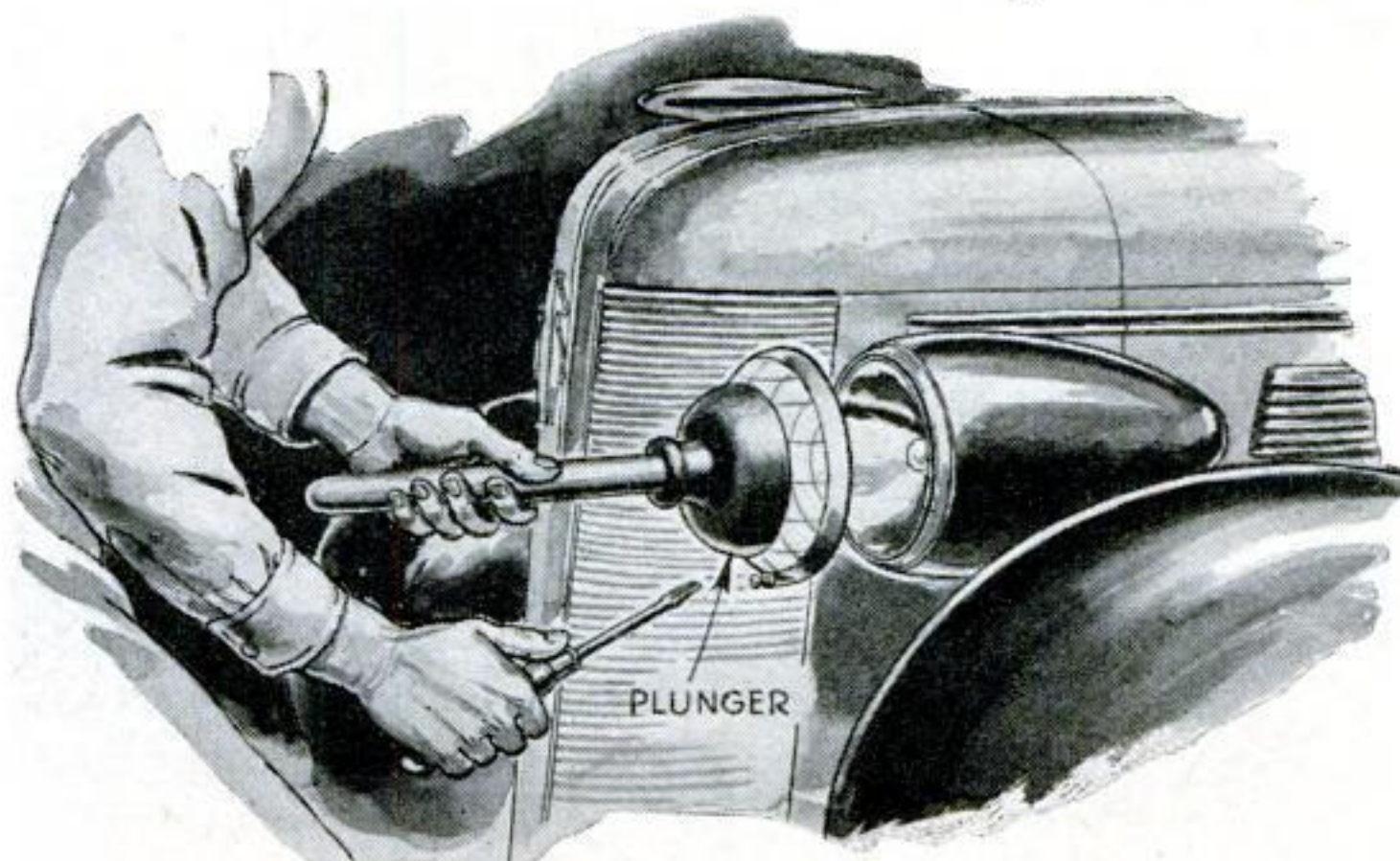


How a curtain rod is employed as a gauge for toe-in

A CURTAIN ROD of the telescoping type can be used to gauge the toe-in of an automobile's front wheels. After straightening out the tips as shown in the drawing, adjust the rod to fit snugly between the inner rims of the two wheels at their front edges. By marking the rod at the joint, and repeating the process at the rear edges of the rims, you can accurately determine the amount of toe-in.—S. R.

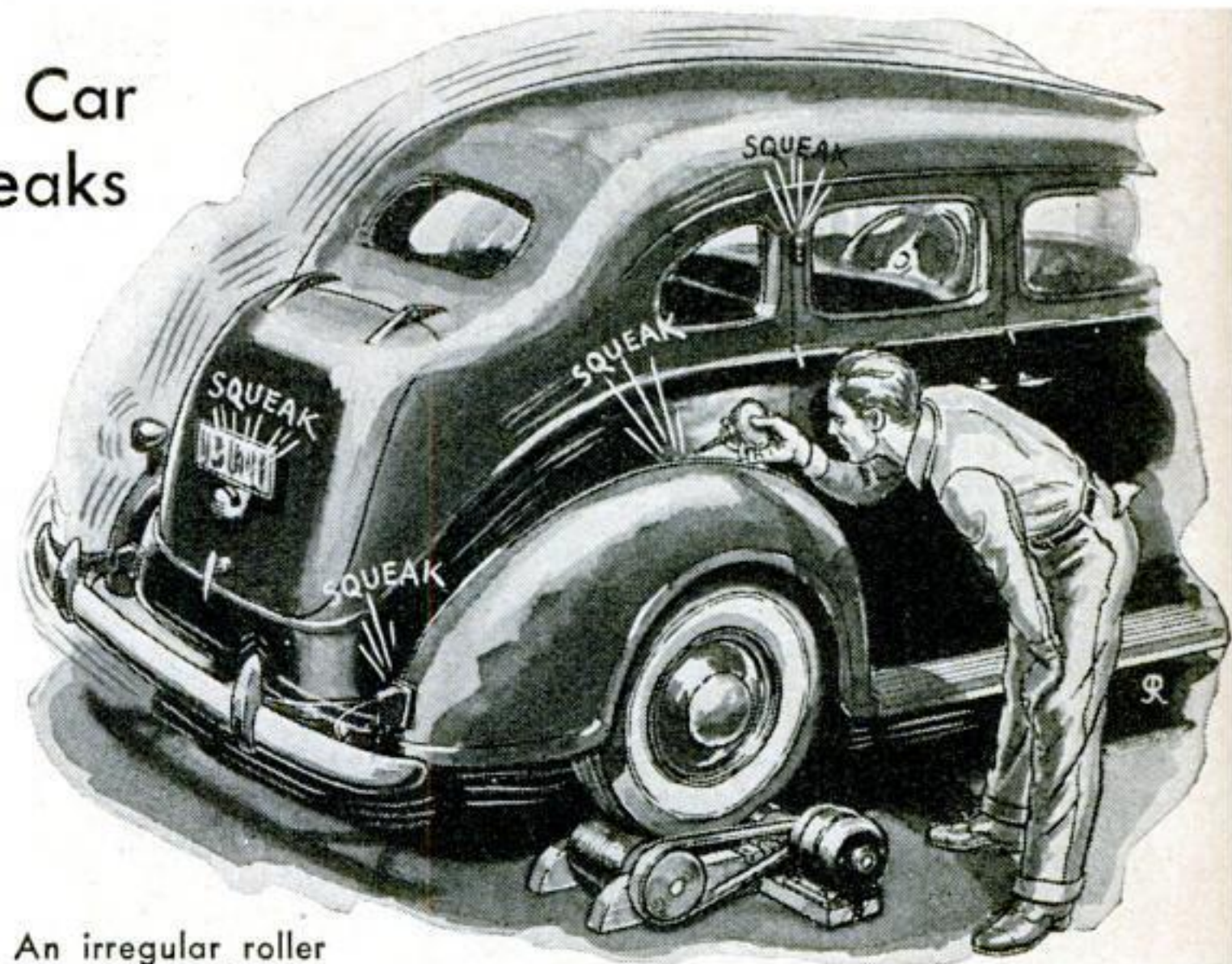
## Plumber's Friend Removes Headlamp Lenses

HEADLIGHT LENSES on late-model cars can be removed easily and with little danger of breaking them, with the aid of a "plumber's friend," or force cup, generally employed for cleaning drains. After the vacuum cup has been pressed against the lens, the headlamp screw is removed and the lens lifted out.—R. W. E.

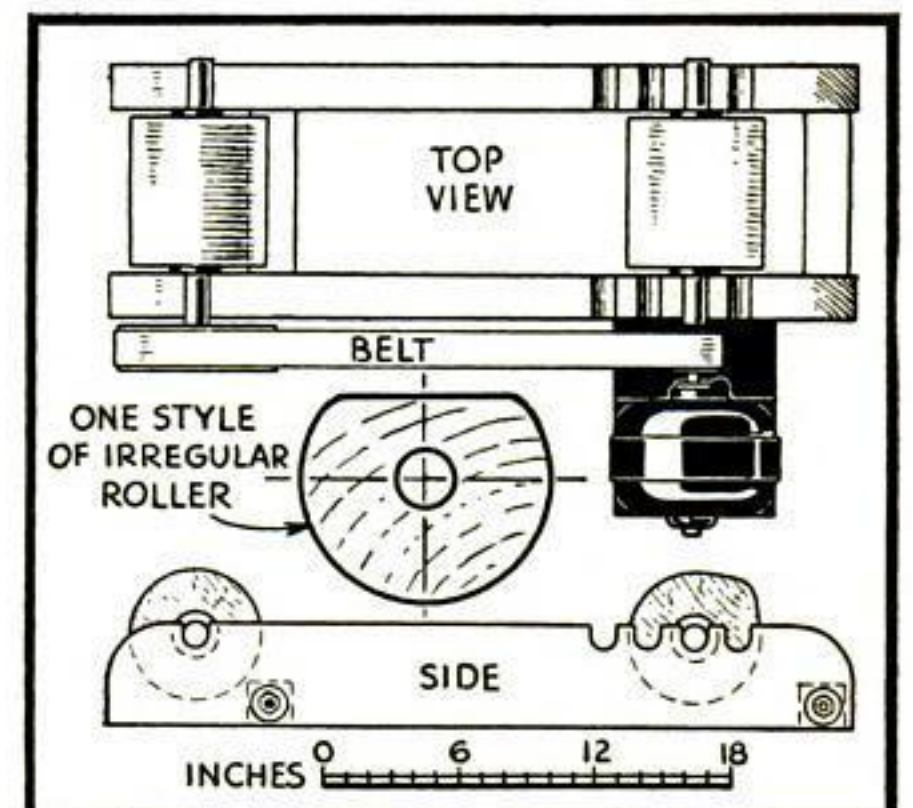


## Rollers Jiggle Car To Find Squeaks

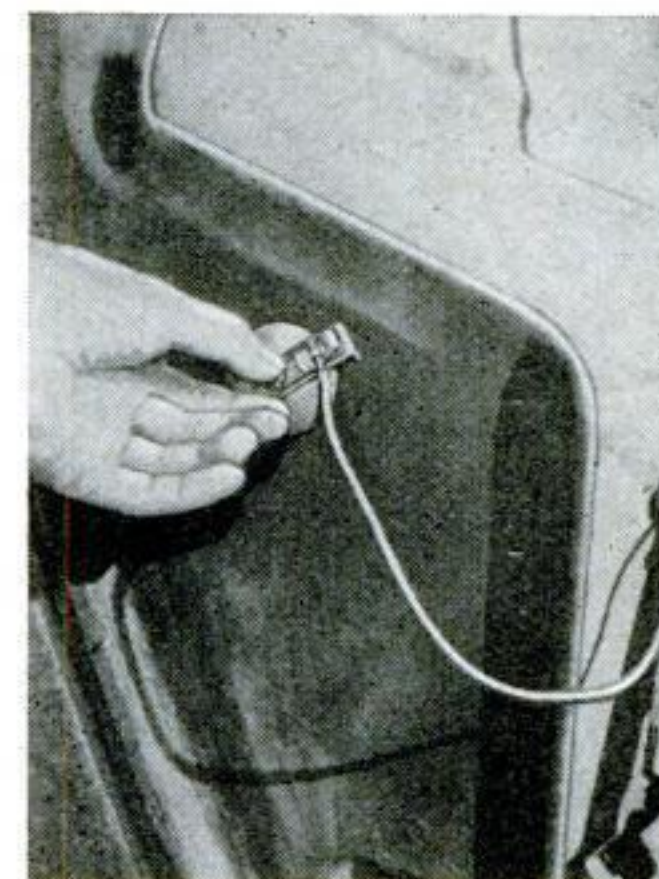
BECAUSE squeaks and rattles are heard only when a car is in motion and are hard to locate on the open road, I rigged up a homemade "squeak finder" that puts my automobile over the bumps right in my garage. The unit consists of two wooden rollers that spin on a supporting base made of hard wood, as shown at the right. An electric motor turns one of the cylinders by means of a belt drive. One side of the car's rear axle is blocked up to keep it parallel with the ground when the wheel on the opposite side is lowered onto the unit. When the electric motor is started, the irregular shape of one of the rollers jars the car much as a rough highway would do. This makes it easy to spot squeaks, rattles, and other noises around the car, and oil them on the spot or make a note of them for later adjustment, oiling, and repair. The rollers may also be turned by putting the car in gear and running the engine.—E. C. H.



An irregular roller reproduces the effect of a rough road



How the noise finder is constructed. A third-horsepower electric motor is used to drive it



## Vacuum Cup Holds Wire To Ground Test Circuit

FOR checking generators, wiring, or car electrical appliances, one end of the test circuit can be conveniently grounded on the chassis with the aid of a vacuum cup unit that adheres to smooth metal surfaces. A strip of spring brass bent to the shape pictured above and fastened to the vacuum cup by a screw and wing nut provides an excellent metallic contact. A spring clip soldered to the brass strip serves as a binding post for the test-circuit wire.—W. C. W.



# Slicing Specimens for

Thin Sections Are Easily Produced with the Help of a Homemade Microtome, or Mechanical Holding Device, the Construction of Which is Described

By MORTON C. WALLING



The homemade microtome being used for sectioning a plant stem. In this case, a straight razor is employed as the cutting tool

SINCE the compound microscope is primarily an instrument for looking *through* things at high magnification, the object on the glass slide must be, in most cases, thin enough to transmit light. Many objects, such as insect wings and the stripped-off epidermis of leaves, are naturally thin enough to make observation easy, even at high powers. But if the science of microscopy were restricted only to materials that nature had made ready for observation, our knowledge of biology and most of the other sciences would be meager indeed.

Early in the development of the microscope, it was found necessary to slice such things as plant stems into thin sections, in order to make visible the mysteries hidden in them. Such slicing was, at first, done entirely by hand. In fact, the art of free-hand sectioning is one that still is very useful to the microscopist, whether amateur or professional.

One popular way of cutting sections by hand is to hold the specimen—say, a plant stem—between the thumb and index finger of one hand, in such a way that the razor slides over, and is guided by, the thumb nail and side of the finger. Some workers find it convenient to lay the stem on a slab of cork or other

material that will not damage the razor blade, hold it with the thumb and finger, and slice it very much as you would cut a loaf of bread. Here, too, the thumb nail can be used to guide the razor.

Although free-hand sectioning is satisfactory to a surprising degree when done by a skilled worker, it is much easier to get first-class results by employing a mechanical device for holding the material being cut and for feeding it past the sectioning knife with such control that the thickness of each slice can be determined very accurately. Such a slicing machine is called a

microtome, meaning "small-cutter."

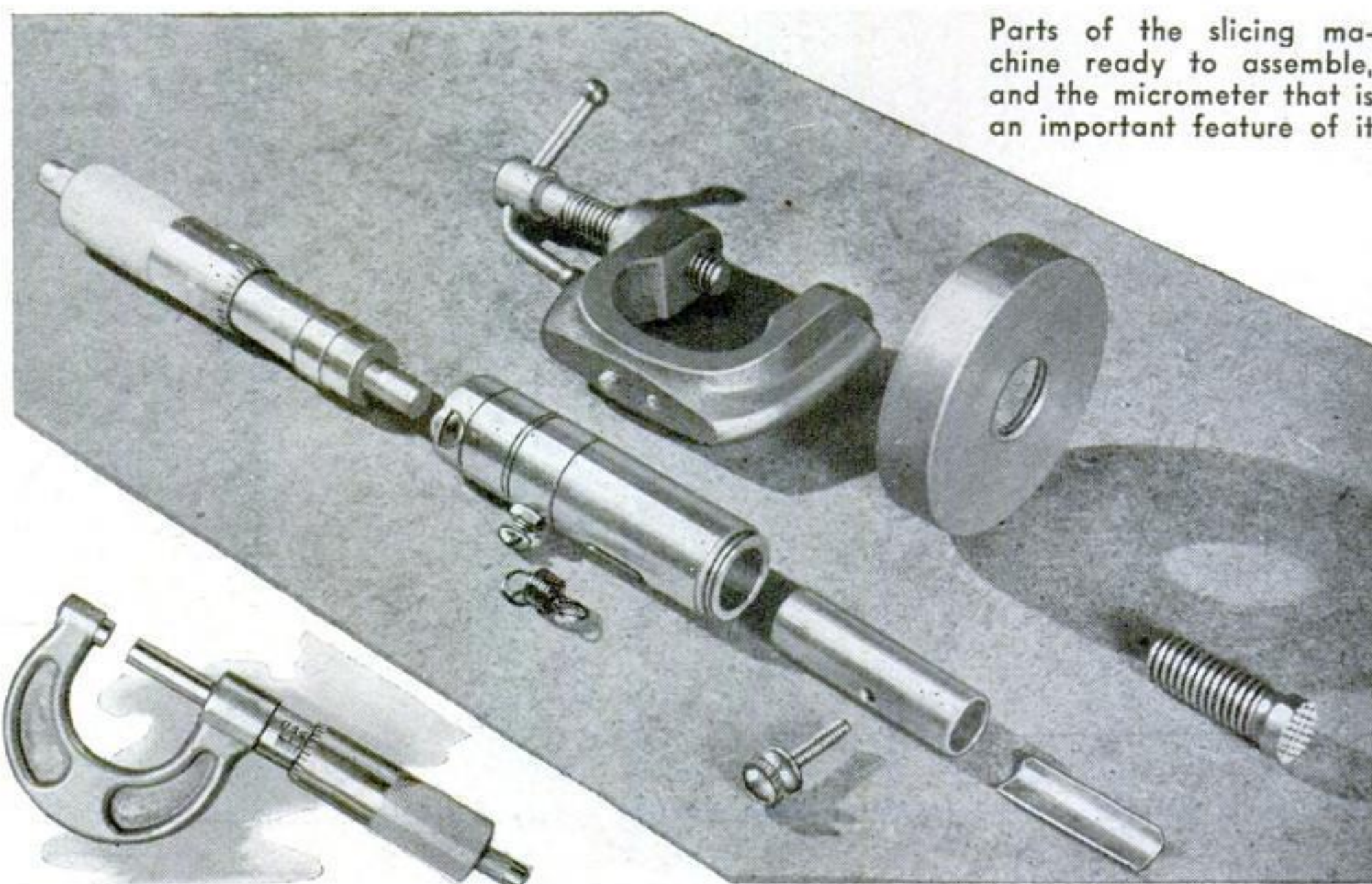
You can, of course, purchase professional microtomes for making sections. A good hand microtome costs about \$16.50, while the price of a highly refined mechanical one may run to \$600 or more. These machines are built with

the precision of microscopes, for they work to tolerances of less than a micron (one thousandth of a millimeter).

It is not at all difficult for the amateur microscopist to build his own slicing machine. Although the construction will be much easier if a metal-working lathe is available, it is possible to turn out a satisfactory job with ordinary tools.

The instrument consists essentially of a body tube, inside of which is a sliding tube or "object holder" that grips the material being sliced. The upper end of the body tube is fitted with a circular platform over which the knife blade slides, and the lower end is provided with a micrometer screw to control the thickness of the sections. Dimensions are given for the various parts, but these can be varied to suit your own ideas or materials. Since the metric system of measurement is standard for microscopes and similar instruments, dimensions will be given in centimeters and millimeters. However, if you want to change them into the English system, a millimeter can be taken as equal to 0.03937 in., and a centimeter to 0.3937 in. An inch equals approximately 2.54 centimeters, 25.4 millimeters, or 25,400 microns.

The body tube is turned from brass. It is 6.5 cm. long and 18 mm. outside diameter, with an inside bore of about 12 mm. The bore extends to a depth of 48 mm. The upper end of the tube



Parts of the slicing machine ready to assemble, and the micrometer that is an important feature of it



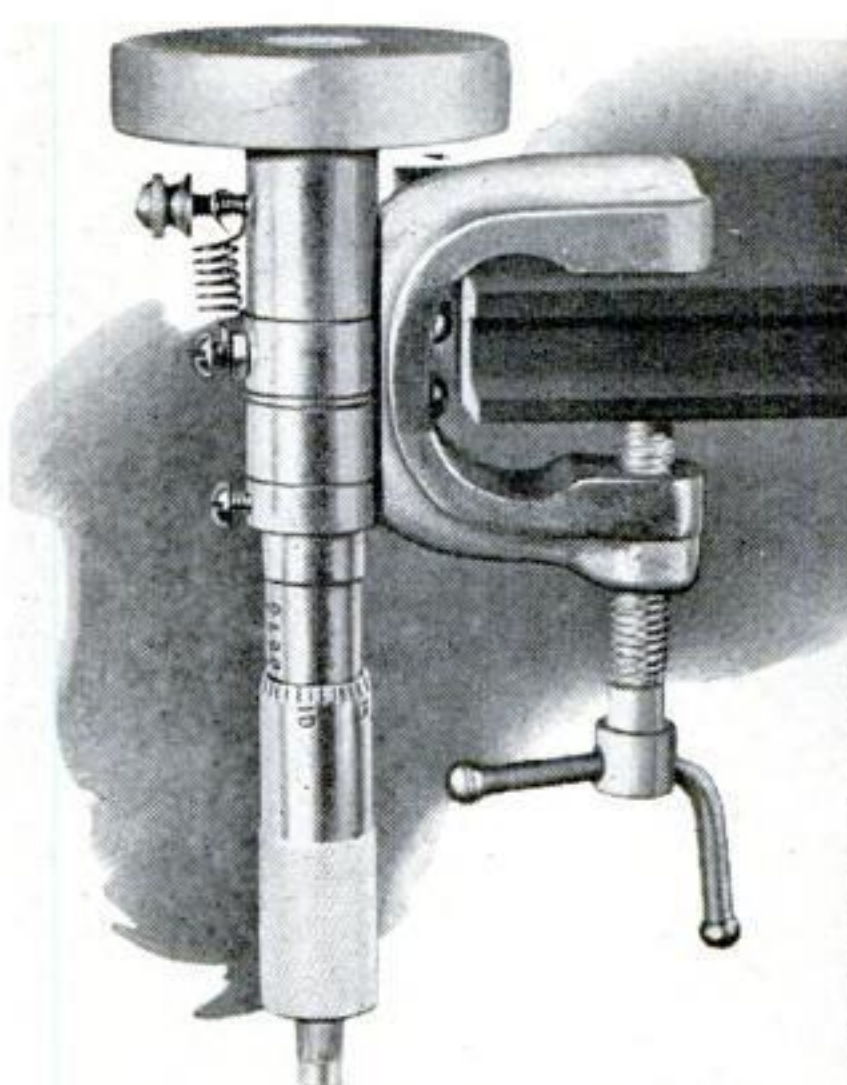
# Your MICROSCOPE

(open end of the bore) is provided either with threads or with a collar, to enable the circular cutting table, 50 mm. in diameter, to be attached. This tube, while best made on a lathe, can be simply a length of brass tubing of any convenient diameter. The tube walls ought to be no less than 2 mm. thick.

Sliding inside the bore is the object holder, similarly made from brass. It has an outside diameter that permits it to fit very snugly in the bore, and a length of 3.6 cm. Wall thickness should be about 1.5 mm. In the microtome illustrated, this part has an outside diameter of 12 mm., an inside diameter of 9 mm., and a length of 3.6 cm.

Beginning about 15 mm. from the top of the body tube, and extending downward for another 15 mm., is a slot in which a 6-32 machine bolt will slide freely. With the object holder inside the body tube, and with the upper ends of both tubes even, make a punch mark on the object holder at the upper end of the slot, and drill and tap it to receive a 6-32 bolt. This bolt, which should be fitted with a knurled nut or head to make it easy to turn, does several things: it serves to clamp the object in position, it limits the upward movement of the object holder so that the knife will not strike the metal, and it serves as an anchorage for one end of a small coil spring whose purpose will be described later.

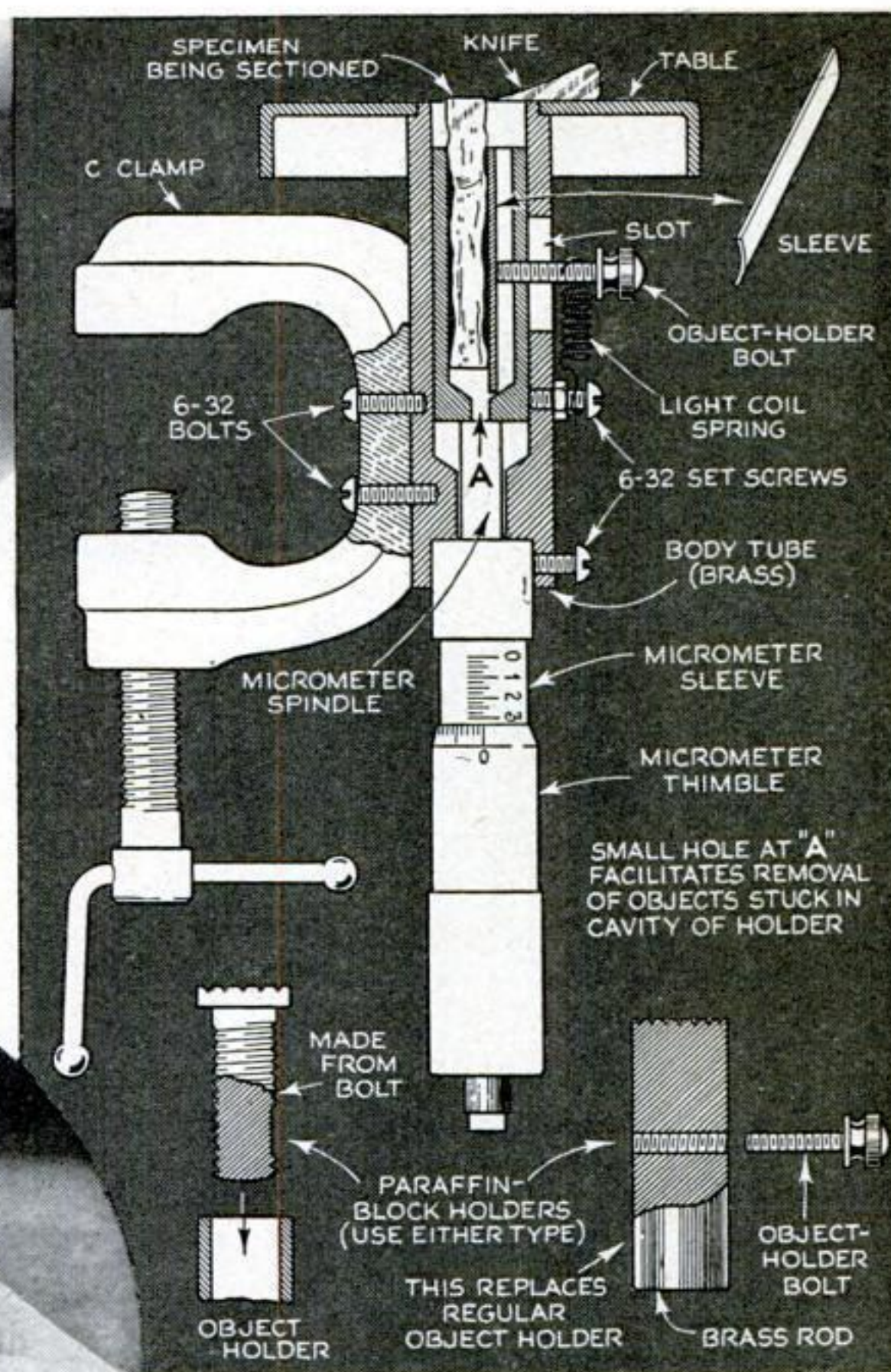
Obtain, at your local hardware or dime-and-dollar store, an inexpensive micrometer of the type illustrated, and of a size that measures diameters up to one inch. This costs about fifty cents. With a hack saw, remove the curved frame as shown, and file or turn the end of the cylindrical, graduated sleeve until it is uniformly round, and perhaps slightly reduced in diameter. Drill or bore out a socket in the lower end of the microtome body tube to receive this end of the sleeve, to a depth of about



Microtome fastened to a table edge by means of its C-clamp attachment. Below, hand-held type in operation



7 mm. The sleeve should fit snugly in the socket. It is held by one or two set screws extending through tapped holes in the body tube. One of these screws can be used to anchor the lower end of the coil spring, although in the photo-



Details of the slicing tool showing how it is assembled from a fifty-cent micrometer

graphs another screw, farther up the side, is shown.

The movable spindle is 6.35 mm. ( $\frac{1}{4}$  in.) in diameter. To make room for it in the body tube, drill a hole about half again as large, connecting the bore and the socket for the micrometer sleeve. Now, with the parts assembled, you can feed the object holder upward by turning the thimble (knurled, movable part) of the micrometer to the right. It would be better if a [\(Continued on page 121\)](#)

## Don't Handicap Your Instrument with Dirty Lenses

DIRTY lenses are a common cause of poor performance in a compound microscope. If you see spots when you look into the instrument, the chances are that the eyepiece lenses are dirty. Rotate the eyepiece while looking through it and if the spots rotate too, you can be certain the trouble is there. Dirty objective lenses cause general loss of definition.

Make it a habit to remove the objectives periodically and clean them, especially the inner surfaces where dust falling down the tube settles. With a fine camel's-hair brush, you

can lift off much of the dirt without scratching the glass. Finally, after the gritty particles have been removed in this way, clean the lens surfaces with special lens tissue, or with a *well-washed* piece of linen or cham-*ois* skin. Wipe gently with a circular motion, and if necessary moisten the glass by breathing on it.

Never use alcohol, water, or other liquid for cleaning high-grade lenses, except when you employ xylol to remove immersion oil from high-power objectives. If you clean an oil-immersion objective immediately after it is used, you generally need nothing

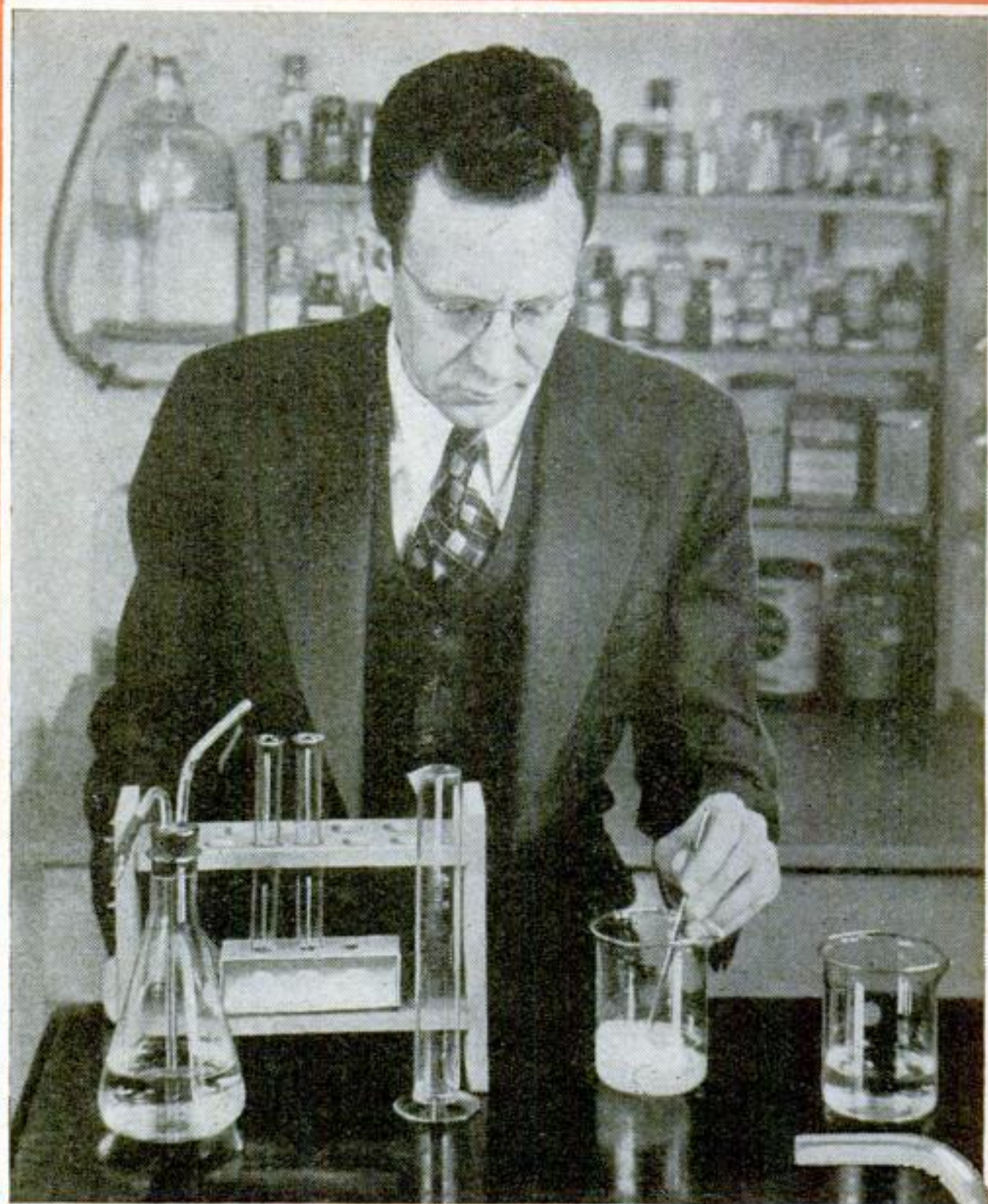
more than lens paper. Revolve the lens against the paper, so that the glass is wiped with a circular motion.

Much trouble can be avoided by keeping dirt from the lenses in the first place. Do not attempt to take an objective apart, unless it is of a type that is divisible to produce different magnifications. Keep removable objectives in their screw-capped containers when not in use. If you do leave them attached to the microscope, store the instrument under a bell jar or in some other dust-tight container when not in use.



# Color Chemistry

RAINBOW HUES HELP IDENTIFY UNKNOWN SUBSTANCES



A test with a homemade colorimeter shows how absorbent cotton "adsorbs" lead from a solution of lead nitrate

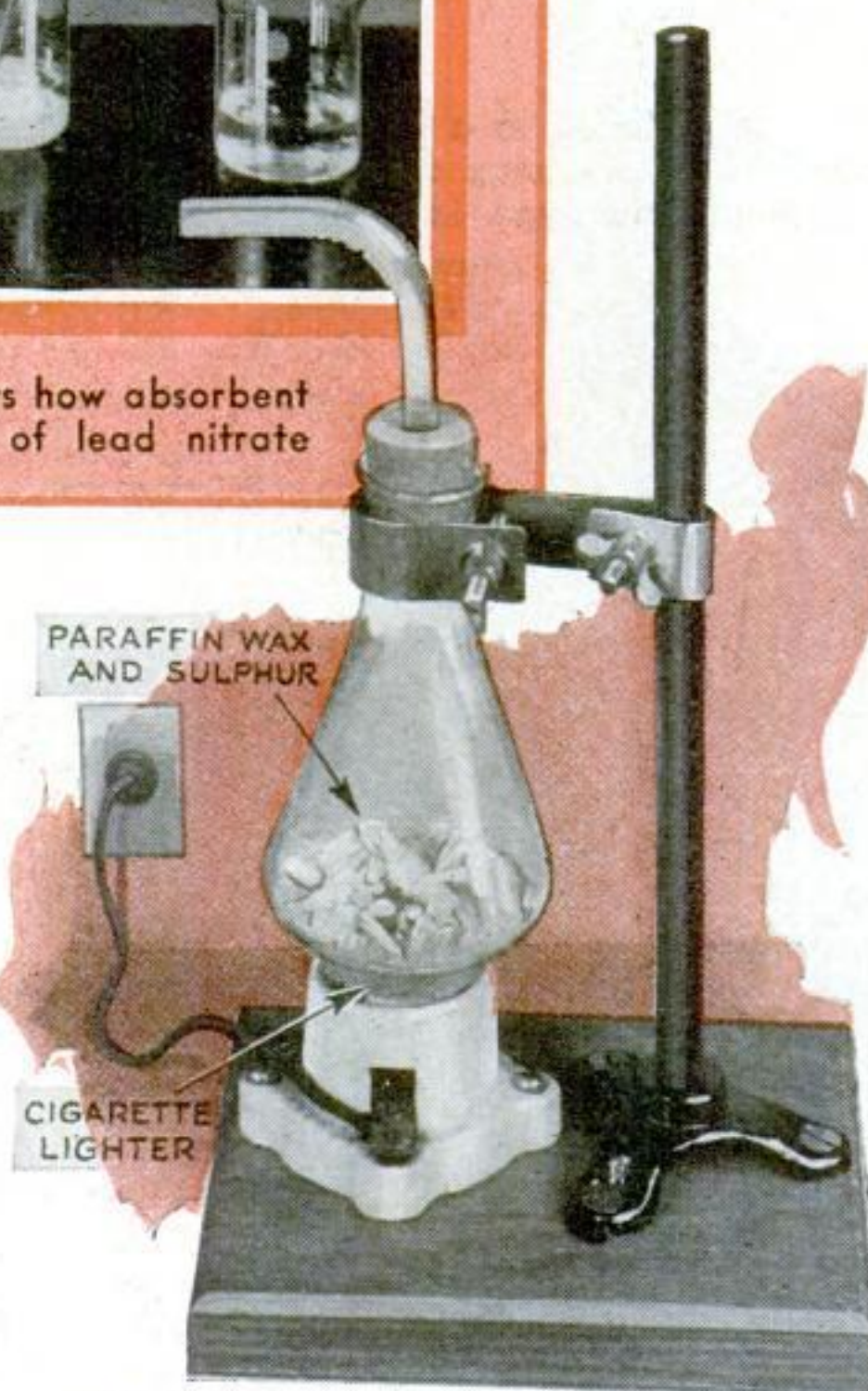
By  
**RAYMOND B. WAILES**

**C**OLORS that appear when you mix different chemicals in your test tubes may be informative as well as entertaining to produce. Often it is by observing such tints that professional chemists analyze substances and determine what is in them. Even the amount of a particular ingredient can sometimes be estimated with surprising accuracy in this way. In your own home laboratory, you will enjoy trying out a few color tests that will enable you to identify a variety of substances.

By color, for example, you can easily distinguish tungsten from the variety of other substances that a radio tube contains—including barium, magnesium, nickel, copper, iron, manganese, and molybdenum. Break open a discarded radio tube and remove the filament. Heat this part in a porcelain evaporating dish, or on a piece of sheet iron. Soon the metallic luster will disappear and the material will turn yellow.

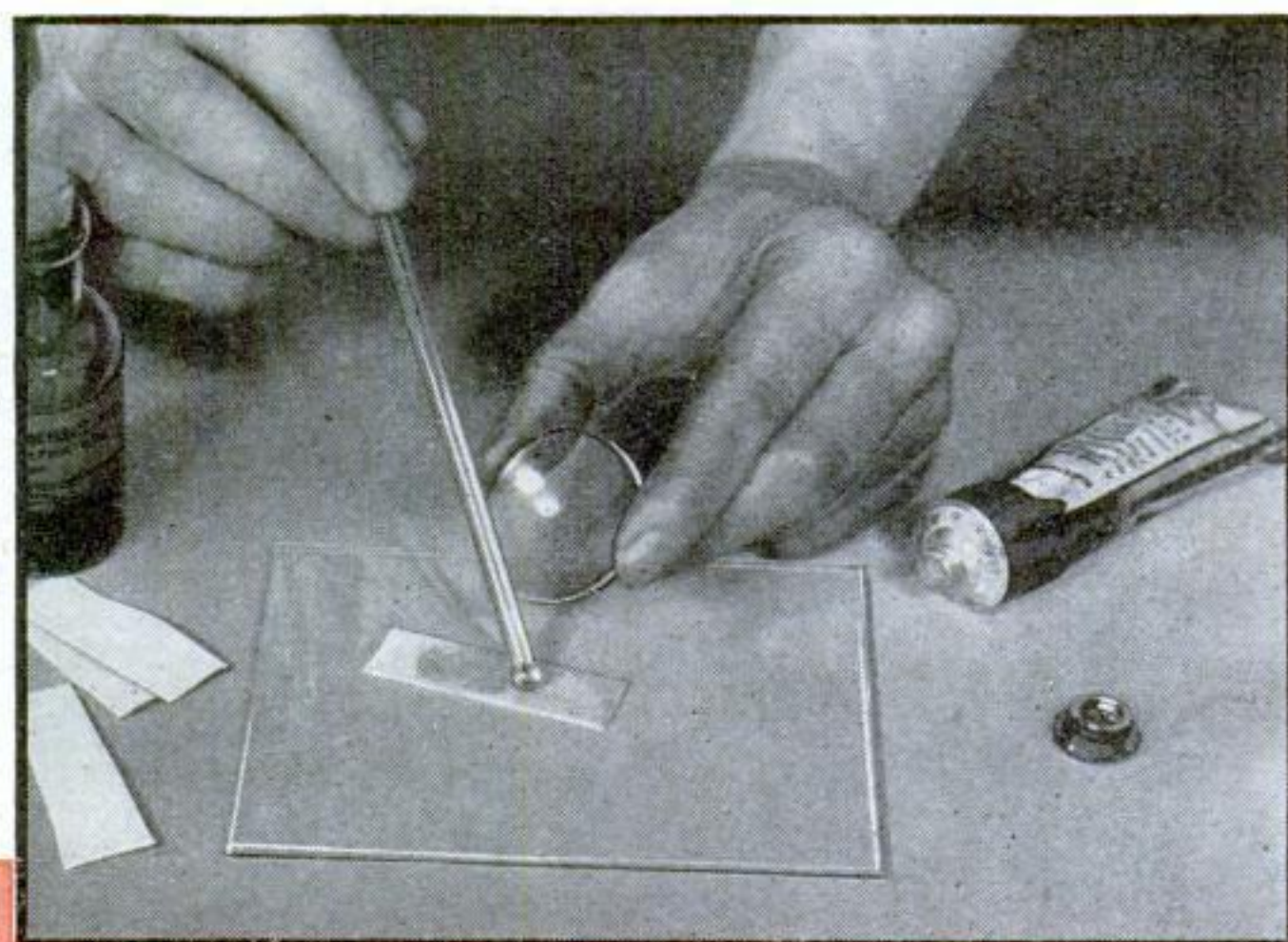
With a pair of forceps, transfer some of the yellow substance to a strip of aluminum that has been freshly cleaned with emery cloth. Add a drop of weak hydrochloric acid. The blue color that forms in the liquid is a characteristic reaction of tungsten, and shows that the metal was present in the filament. The intermediate product formed by heating the metal was the yellow trioxide of tungsten.

You can perform the test for tung-



This is a handy generator for making the hydrogen sulphide used in the experiment

## Making Test Papers To Detect Chlorates in Household Products



Chlorates contained in weed killer and other household products are detected by means of test papers made by soaking filter paper in an ammonium thiocyanate solution

sten in another way by placing some of this trioxide in a test tube, adding several cubic centimeters of dilute hydrochloric acid, and warming it gently. Then add to the solution a piece of tin—not the kind in tin cans, which is sheet iron coated with tin, but the pure metal. A blue color or precipitate will then show that tungsten is present. This test can be applied to minerals suspected of being tungsten ores by heating some of the crushed ore with hydrochloric acid, in which the tin is then placed. Either of the methods used for the radio-tube filament will also detect the tungsten in the filament of an ordinary electric-light bulb.

Because many of them contain potassium chlorate, ordinary weed killers of the type used by the home gardener provide an excellent opportunity to try the test for a chlorate. Homemade test papers for the purpose are easy to prepare. Dissolve two grams of ammonium thiocyanate (also known as ammonium sulphocyanide) in ten cubic centimeters of water, and soak several strips of filter paper in the solution. Thread the papers on a string, and let them dry in a place no hotter than seventy degrees centigrade (about 160 degrees Fahrenheit). They will then be ready for use.



For the test, rub a bit of the weed killer and a little water together upon a watch glass with a stirring rod. Then transfer a drop or two of the resulting liquid, with the rod, to one of the test papers. Place the paper in a warm place—that is, with a temperature of about 100 degrees centigrade. For example, you can lay the paper in a large watch glass suspended over a jet of steam, from the mouth of a flask of boiling water. If a chlorate is present, such as potassium chlorate, the paper will turn yellow during the next five to thirty minutes.

You will know exactly what to look for if you make a preliminary test, using a crystal of potassium chlorate instead of the weed killer and proceeding as just described. Left-over test papers can be employed to detect chlorates that may be present in any mixture.

Ammonium thiocyanate, the reagent you employed in this test, will also enable you to determine whether there is iron in the drinking water you use in your home. Commonly it is present, but at most there will be very little of it, so you will need to concentrate it for your test. This may be done by evaporating or boiling down about 100 cubic centimeters (three or four fluid ounces) of tap water in a beaker, until only a few drops of water remain. At this point, add a drop of chemically pure hydrochloric acid, and continue evaporating just to dryness.

Now add several more drops of hydrochloric acid, followed by five cubic centimeters of water and a drop of nitric acid. Warm the solution gently, and transfer it to a test tube. Rinse the beaker with several cubic centimeters of water, which should also be placed in the test tube. Finally, add to the test tube one or two cubic centimeters of a dilute solution of ammonium thiocyanate or of potassium thiocyanate, made by dissolving two grams (a teaspoon holds approximately five grams) of either chemical in 100 cubic centimeters of water. The solution in the tube will now turn red if there was an appreciable amount of iron in the water, the depth of color increasing

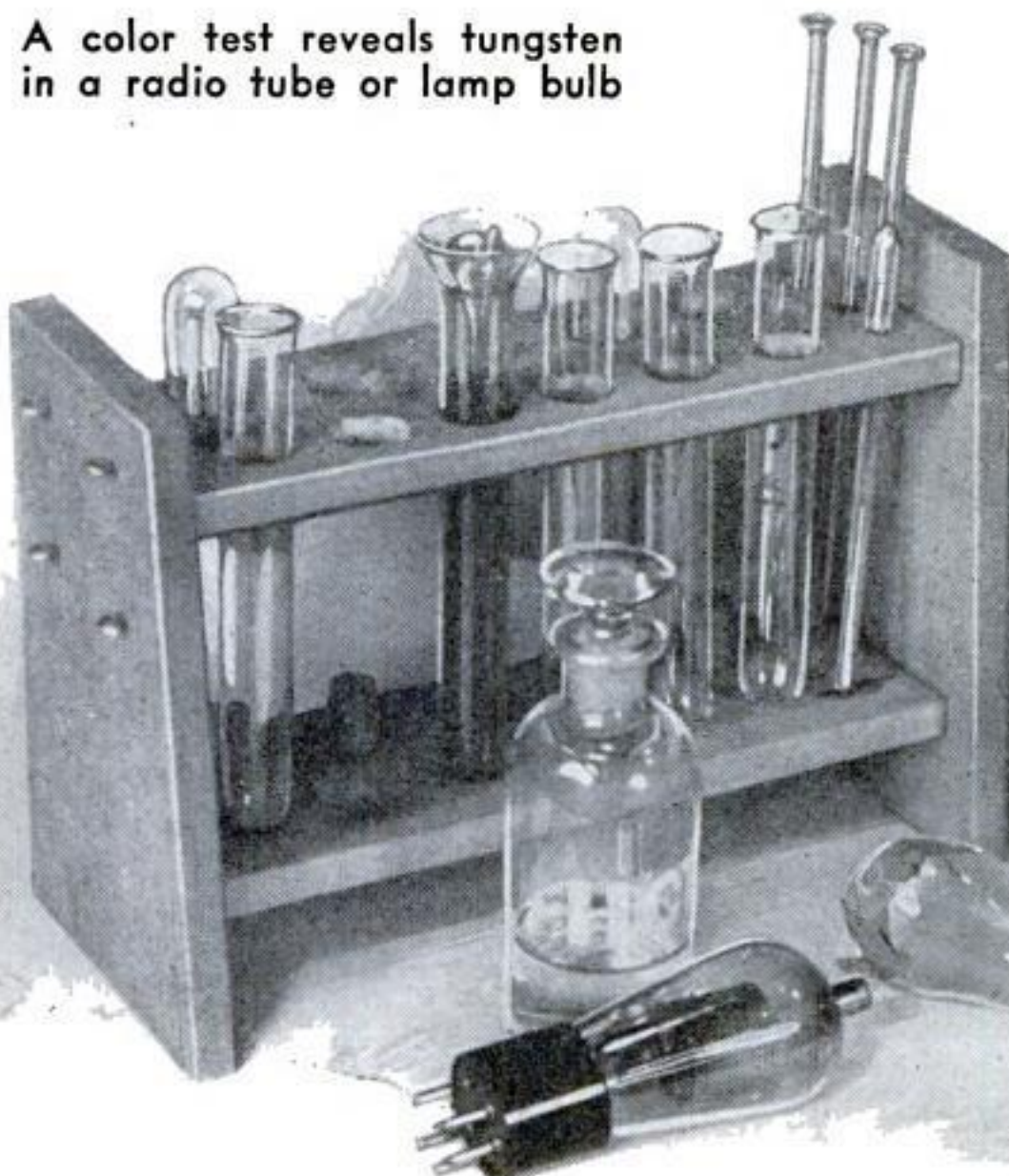


How a radio tube can be broken safely to obtain the filament for a tungsten test

with the quantity of iron. Traces of iron too small to respond to the test just described can be detected by starting with a greater amount of water—say, 250 cubic centimeters (an average drinking glass)—and proceeding as before.

Professional analysts observe color reactions like this with the aid of a device called a colorimeter, which enables them to detect the slightest color change and even to gauge the amount of iron or other material present. You can make yourself a simple but effective colorimeter from an ordinary test-tube rack. As shown in an accompanying illustration, all you need add is a rest for the bottoms of the tubes, and a reflecting surface mounted beneath it at a forty-five-degree slant. The reflector may be white paper, covered with a sheet of glass. To compare the colors of solutions in a pair of test tubes, you place the tubes in the colorimeter and look straight down into them. Light from the reflector, passing up through the length of the solution in each tube, shows up the

A color test reveals tungsten in a radio tube or lamp bulb

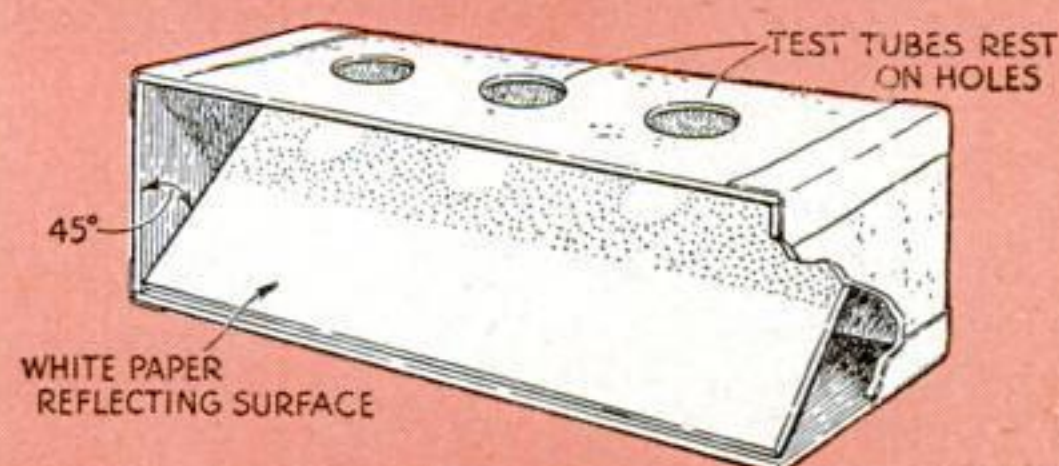
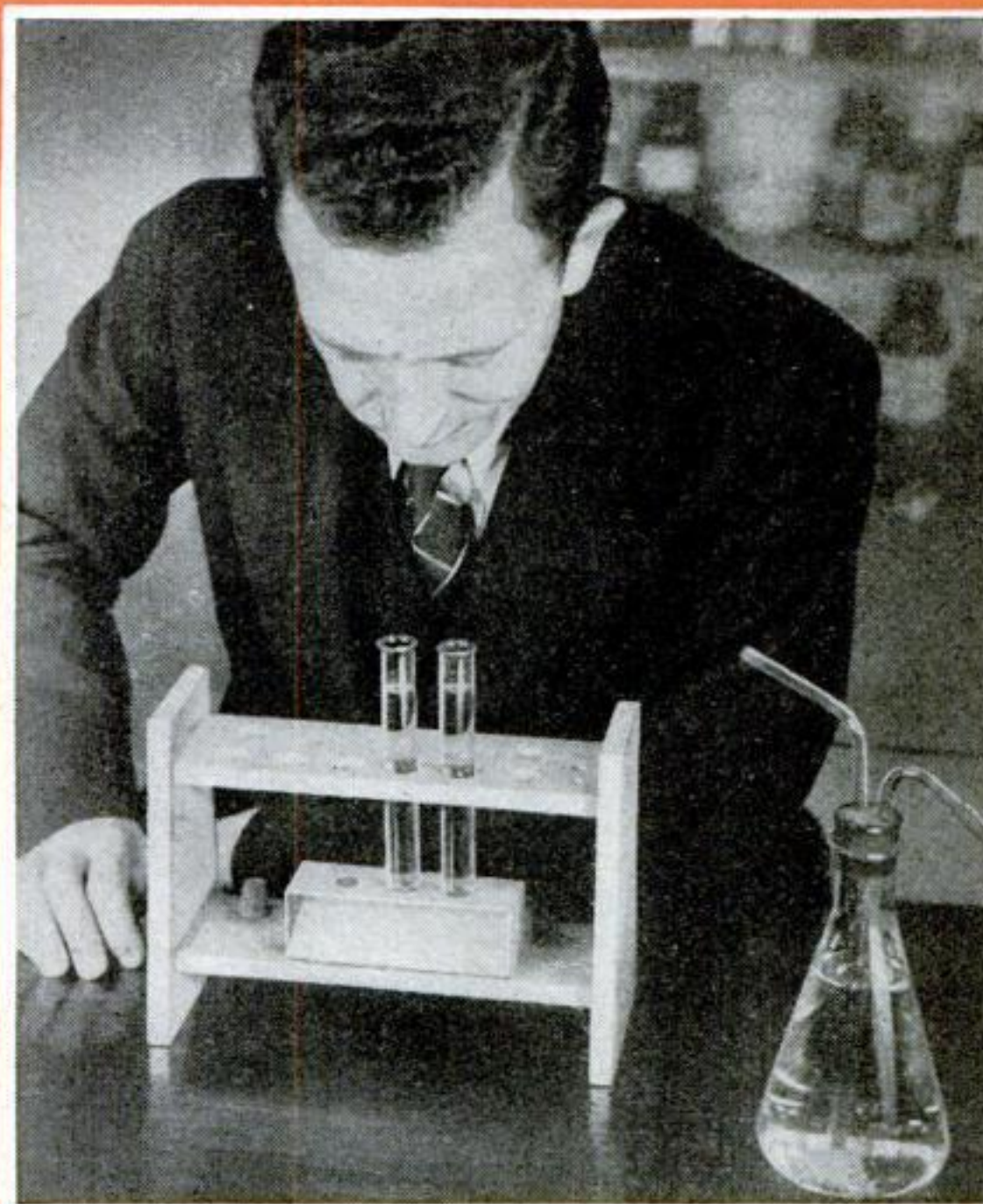


Yellow trioxide of tungsten, formed by heating the filament, gives a blue precipitate when warmed in dilute hydrochloric acid to which a small piece of pure tin has been added

color much more plainly than you can observe it by viewing the tube from the side.

Suppose you take 100 cubic centimeters of water from each of two sources—say, your home supply and a near-by spring—and proceed in exactly the same way, with the same amounts of chemicals, to test each one for iron. Then you can place the two tubes of colored solution in your colorimeter and determine at once from the depth of shade which kind of water contains more iron. To measure the exact amount, a professional chemist would simply match the color of the test solution against a set of “standard” solutions, containing known amounts of iron and submitted to the same procedure.

Through the curious process known as “adsorption,” a wad of absorbent cotton will actually abstract material from a solution in water, as you can demonstrate with your homemade colorimeter. Dissolve a bit of lead nitrate or of lead acetate, approximately the size of the head of a pin, in about 500 cubic centimeters of water. Immediately measure out two accurate 100-cubic-centimeter portions of the liquid and place each one in a clean beaker. Drop a piece of absorbent cotton in one of the beakers, and swirl it around with a stirring rod for about five minutes. The contents of the other beakers may [\(Continued on page 125\)](#)



A HOMEMADE COLOR-GAUGING DEVICE

An ordinary test-tube rack makes an effective colorimeter when fitted with the reflecting bottom rest shown in the drawing. Light reflected upward through liquids reveals comparative colorations



# Suitcase Radio

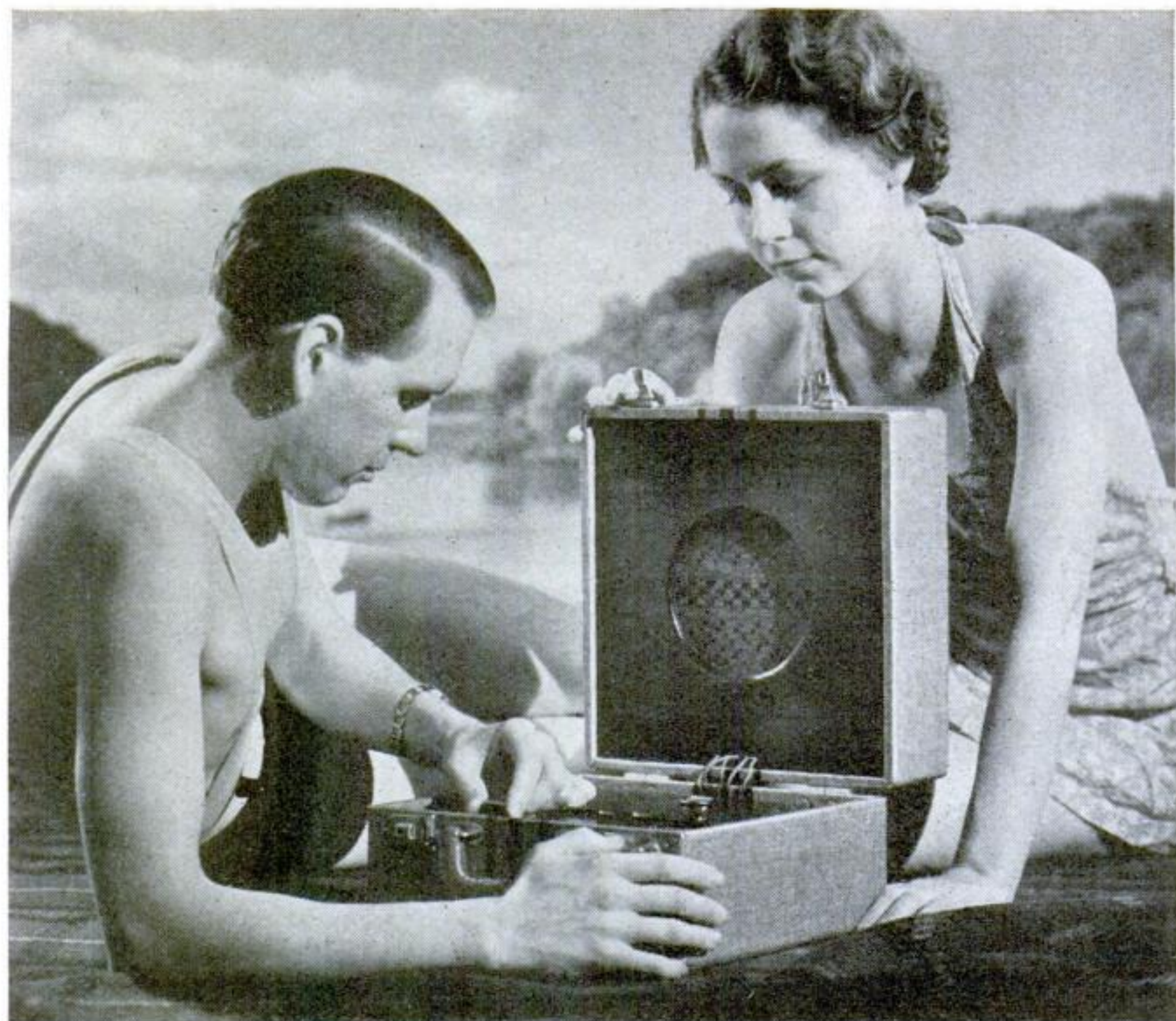
**HAS  
BUILT-IN AERIAL  
AND SPEAKER**

**W**HETHER you travel a great deal or not, this handsome suitcase portable receiver will form a useful addition to your radio equipment. Powered by a built-in battery supply, it can be used on picnics, at the beach, in your car, or in a boat or canoe. Little larger than an ordinary hat box, it can be just as easily tucked away in a corner of a closet when not in use.

Besides its portability, the compact circuit has another feature that makes it one of the few outfits that can be put into immediate operation anywhere without first rigging a troublesome antenna or installing a ground. This convenience has been incorporated by winding the circuit's grid and tickler coils around a specially constructed frame mounted inside the top of the case (see photograph on opposite page). This large coil, which acts as a loop antenna, consists of twenty-four turns of No. 24 double-cotton-covered copper wire,

By **ARTHUR MILLER**

A hinged panel covers the batteries and supports the L-shaped chassis



This attractive portable will provide radio entertainment anywhere

tapped at the sixth turn to divide it into two sections.

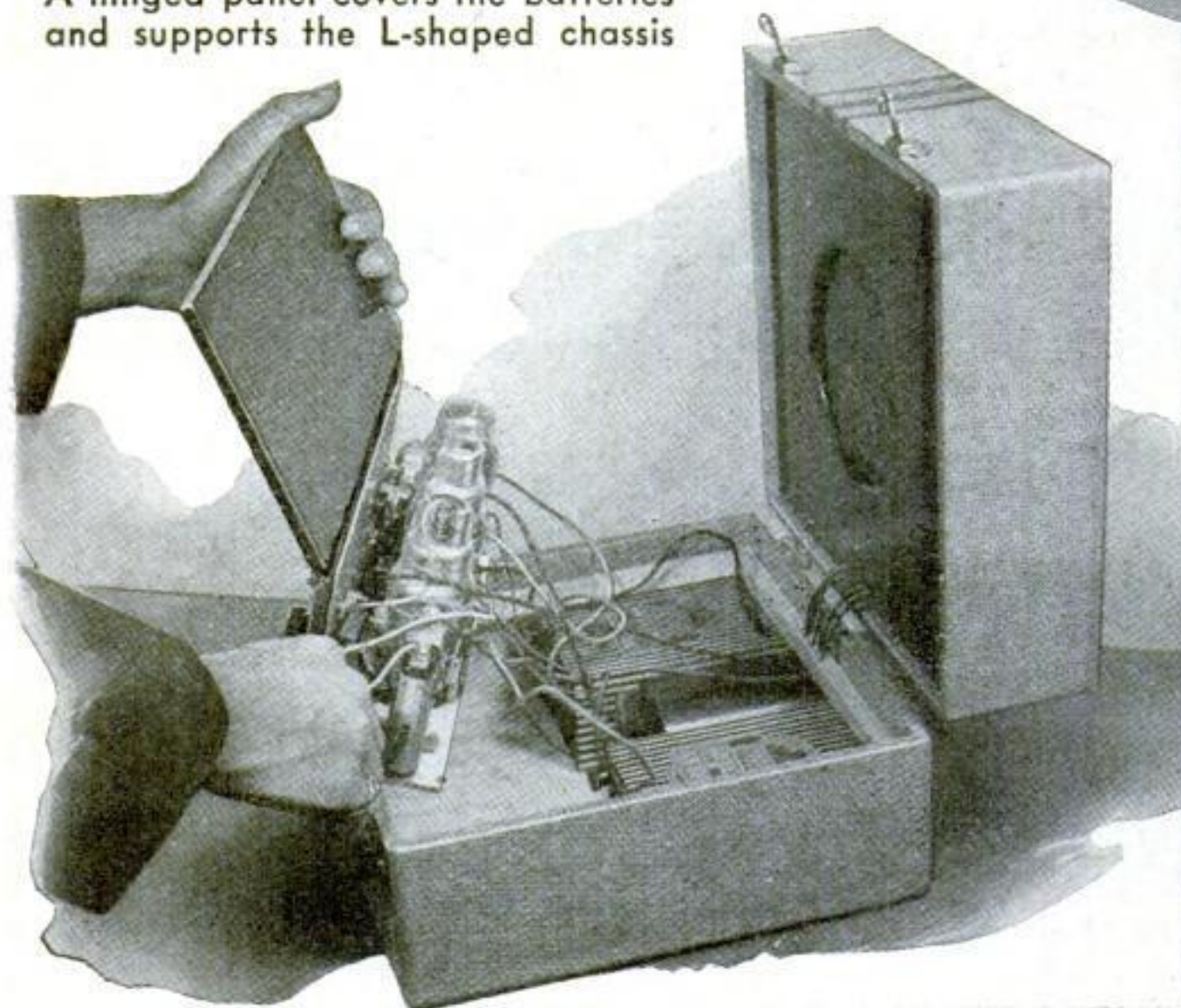
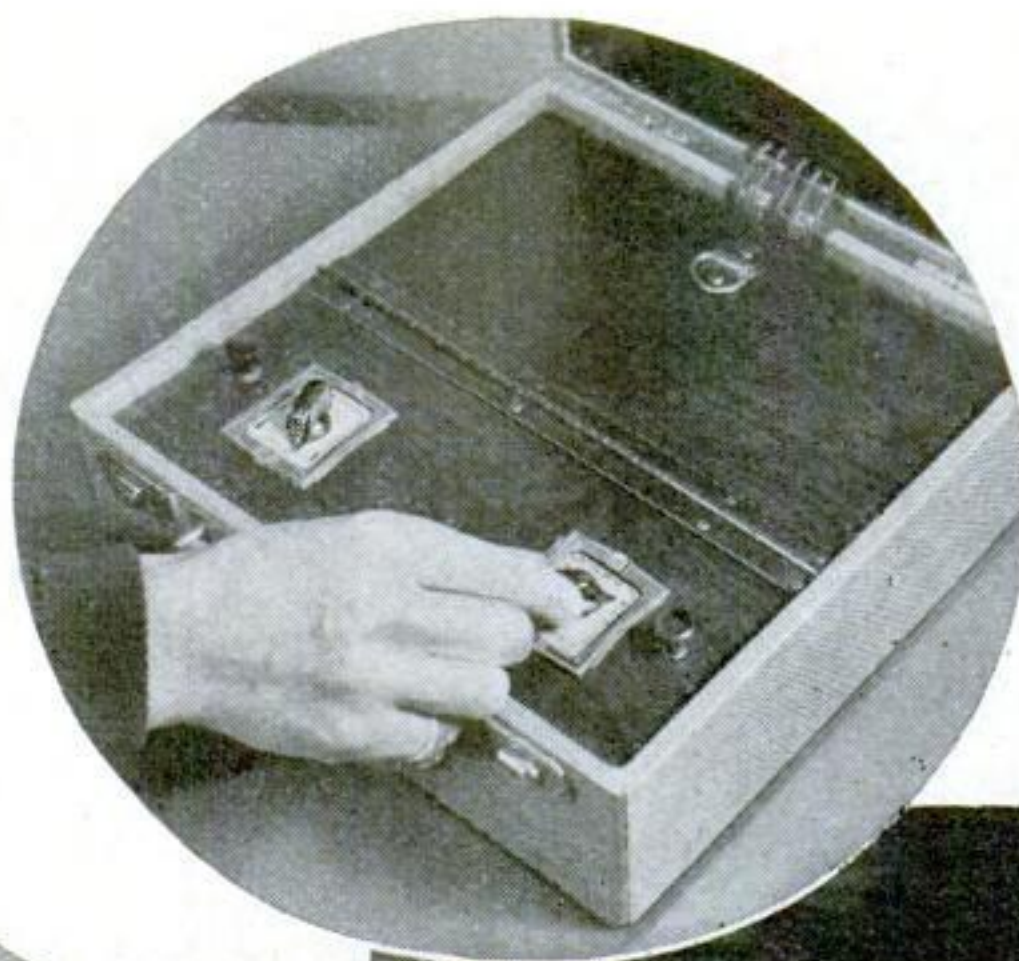
The larger section serves as the receiver's grid coil and a special compact variable condenser connected across it, as shown in the diagram, provides the tuning adjustment. This type of condenser, which has thin sheets of insula-

tion between the fixed and movable plates instead of the usual air space, can be obtained from most large mail-order, radio-parts supply houses. Because it requires less mounting space than the ordinary tuning condenser, it is an ideal unit for use in portable circuits. However, if you have difficulty obtaining one, you can, by rearranging the placement of parts slightly, substitute the conventional air-spaced unit.

The smaller section of the coil is the tickler winding and is connected through a .00005-mfd. fixed mica condenser to the plate of the first tube (1E5G). A 15,000-ohm variable potentiometer, connected across the coil serves as the regeneration control.

To eliminate the necessity of using several tuning condensers, the radio-

Two controls operate the receiver circuit, whose parts and three tubes are mounted as shown below





frequency tube is untuned and coupled to the detector (1E5G) by means of a 125-mh. iron-core plate choke and a .00025-mfd. fixed mica condenser. The detector tube is in turn resistance-coupled to the pentode output tube (1E5G). A radio-frequency filtering system, consisting of a small 2.5-mh. choke and a .0005-mfd. mica condenser, has been placed in the output circuit of the detector tube in order to isolate the radio-frequency portion of the set from the audio-frequency section. To further improve the stability and tuning, a .004-mfd. mica by-pass condenser is connected between the plate of the last tube and the metal chassis, and the aluminum frame of the six-inch magnetic speaker is grounded through the tapped portion of the combination coil and loop antenna, as shown in the diagram. Since the depth behind the loudspeaker panel is little more than two and five eighths inches, the builder must be careful to choose a speaker having its bulky magnets mounted to one side of the center of the cone rather than at the rear. Such speakers are readily available.

The lower portion of the suitcase houses the complete "A" and "B" battery supply and the receiver circuit proper. The three tubes specified are the latest glass-metal types with octal bases. Tight fitting shields should be used on the first two tubes, and care must be taken to see that they are grounded to the aluminum chassis.

In placing the batteries notice that the  $4\frac{1}{2}$ -volt "C" unit is placed to one side of the radio-frequency tube. It is held in position by a thin aluminum band bolted to the chassis, the metal strip making connection with the positive terminal of the battery. A three-ohm fixed resistor mounted directly behind the power tube serves to reduce the three-volt "A" battery to the two volts recommended for the filaments of the tubes. Two portable-size, forty-five-volt "B" batteries connected in series provide the ninety volts required for the plate supply.

The chassis, which is L-shaped, should measure 3 by  $4\frac{1}{2}$  by  $10\frac{1}{4}$  inches. It can be bent easily from sheet aluminum.

In mounting the circuit, particularly the tube sockets, place a piece of cardboard between the parts and the aluminum chassis. This will eliminate any possibility of the soldering lugs coming in contact with the metal, which would

produce a short circuit.

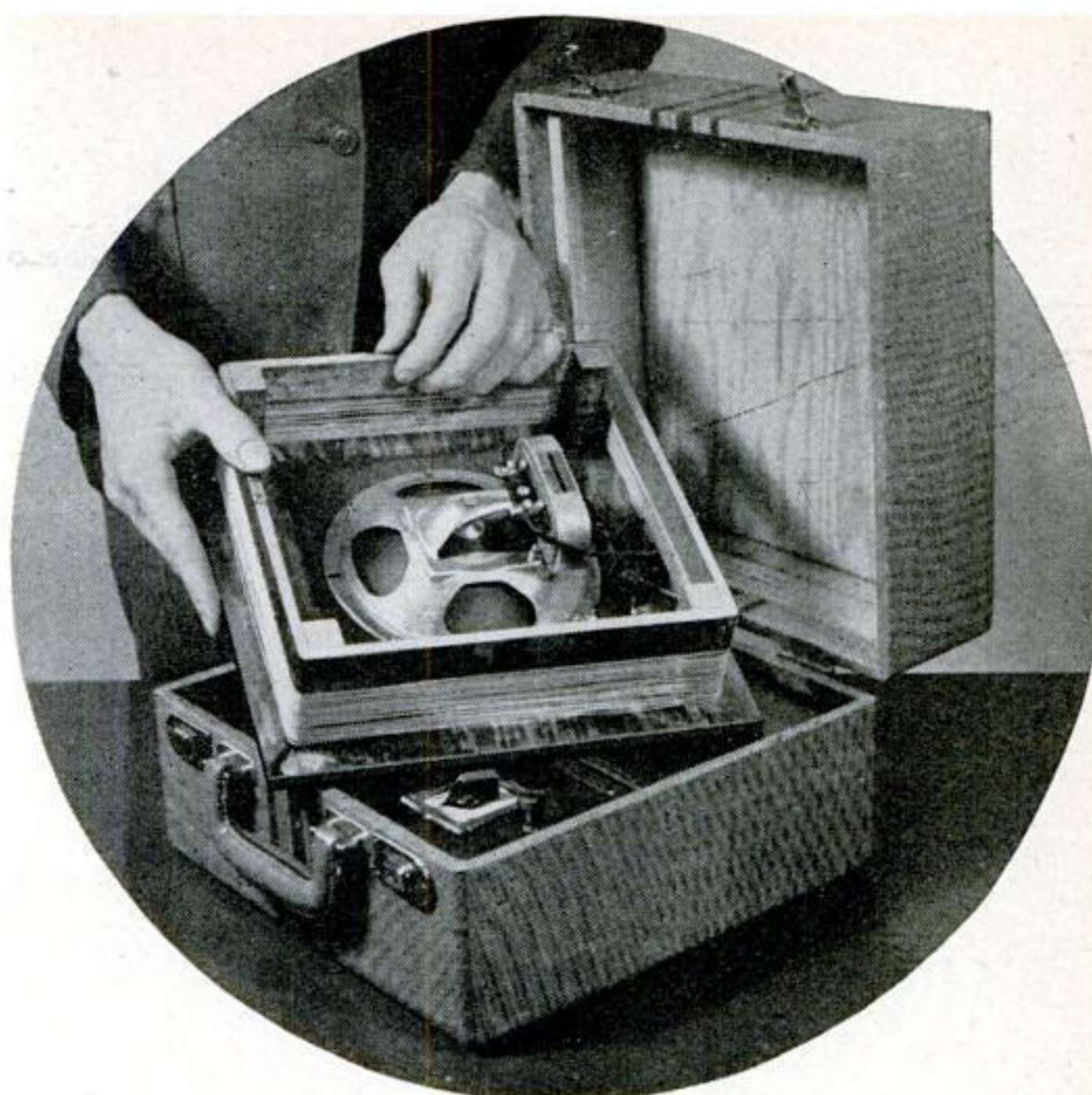
Constructed of three-eighths-inch pine and covered with attractively striped "airplane" suitcase cloth, the cabinet can be easily assembled by anyone handy with tools. If you have no tools available, your local trunk repairman or luggage shop will be glad to construct a suitable unit to your specifications. For the hinges and other hardware, rustproof metal should be used. This is doubly important if the outfit is to be used at the beach or on a boat.

As a glance at the various photographs will show, the bottom half of the case is covered with a hinged panel. This should be one-quarter inch thick and stained a dark brown. The L-shaped chassis is bolted to the lower section of this divided panel by means of the auxiliary antenna and ground binding posts. These are situated on each side of the controls and were incorporated in the circuit to make it possible to use a regulation antenna and ground when they were available.

The upper half of the panel, which covers the battery supply, should be provided with a brass ring, or some form of handle, so that it can be opened easily to allow access to the batteries.

In building the cabinet, much will depend on the selection of the parts. If the parts specified are used, the entire circuit can be mounted in a case measuring 9 by 12 by 12 inches when closed. However, if more bulky units are chosen, the dimensions may have to increase accordingly. For this reason it is best to assemble the circuit first before ordering the materials for the case.

Although the original cabinet shown in the photographs is covered with light-colored airplane suitcase cloth, leatherette or plain canvas can be used if desired.

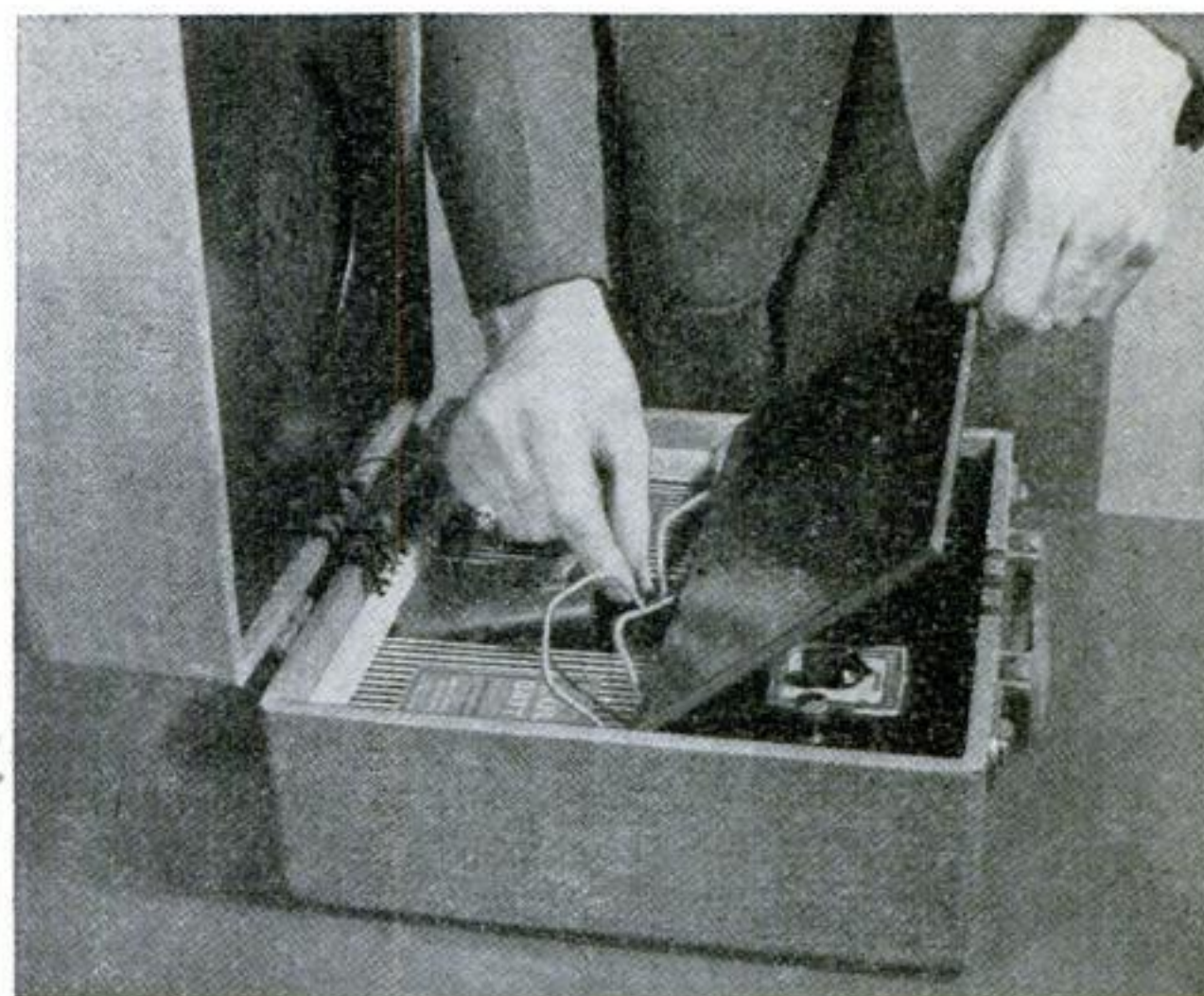
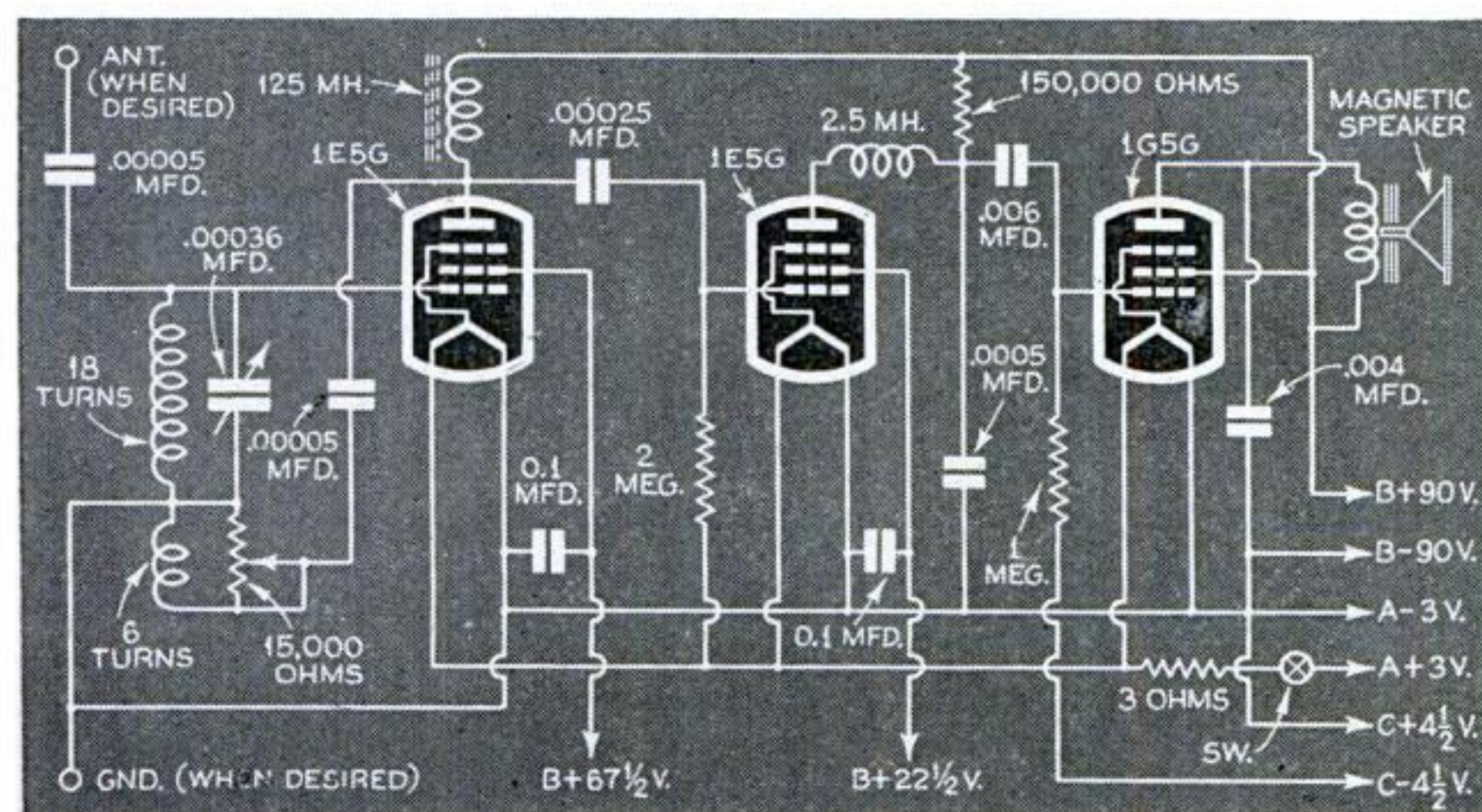


The loudspeaker and the large coil of wire which serves as the loop antenna are concealed in the top of the suitcase cabinet

## WHAT YOU NEED

- Variable tuning condenser, .00036 mfd.
- Fixed mica condensers, two, .00005 mfd.
- Fixed mica condenser, .0005 mfd.
- Fixed mica condenser, .004 mfd.
- Fixed mica condenser, .006 mfd.
- Fixed mica condenser, .00025 mfd.
- Fixed tubular condensers, two, 1 mfd
- Fixed resistor, 1 meg.,  $\frac{1}{2}$  watt.
- Fixed resistor, 2 meg.,  $\frac{1}{2}$  watt.
- Fixed resistor, 150,000 ohms,  $\frac{1}{2}$  watt.
- Filament resistor, 3 ohms.
- Regeneration control, potentiometer, 15,000 ohms.
- Choke, iron core, 125 mh.
- Choke, detector plate, 2.5 mh.

*Miscellaneous.*—Batteries, chassis, cabinet, dials, knobs, magnetic speaker, tube shields, octal sockets, tubes, speaker cloth, wire, solder, lugs, etc.



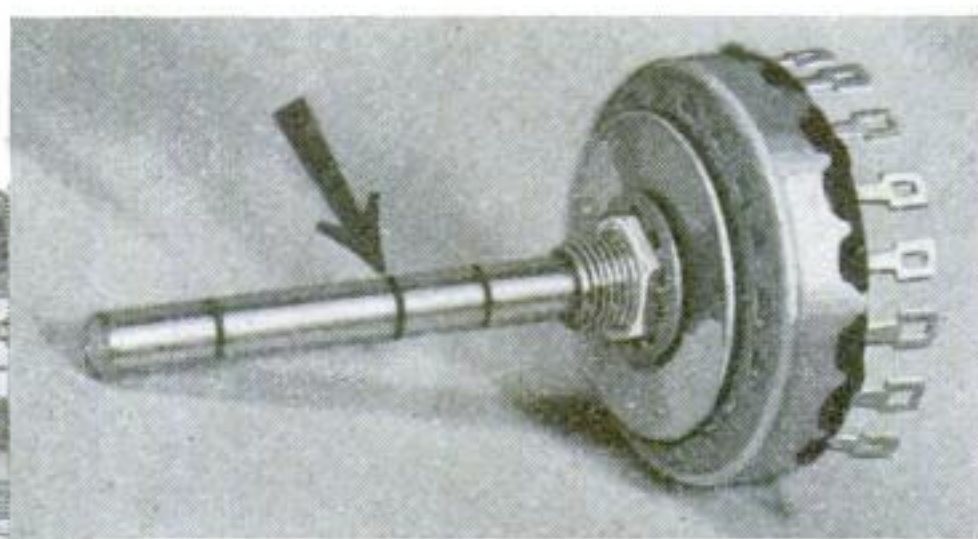
The power supply, as indicated in the diagram, is mounted above the receiver circuit. Four batteries provide the necessary current



# New Ideas for Radio Fans



Conveniently spaced notches guide the saw blade for cutting control rods to the length required

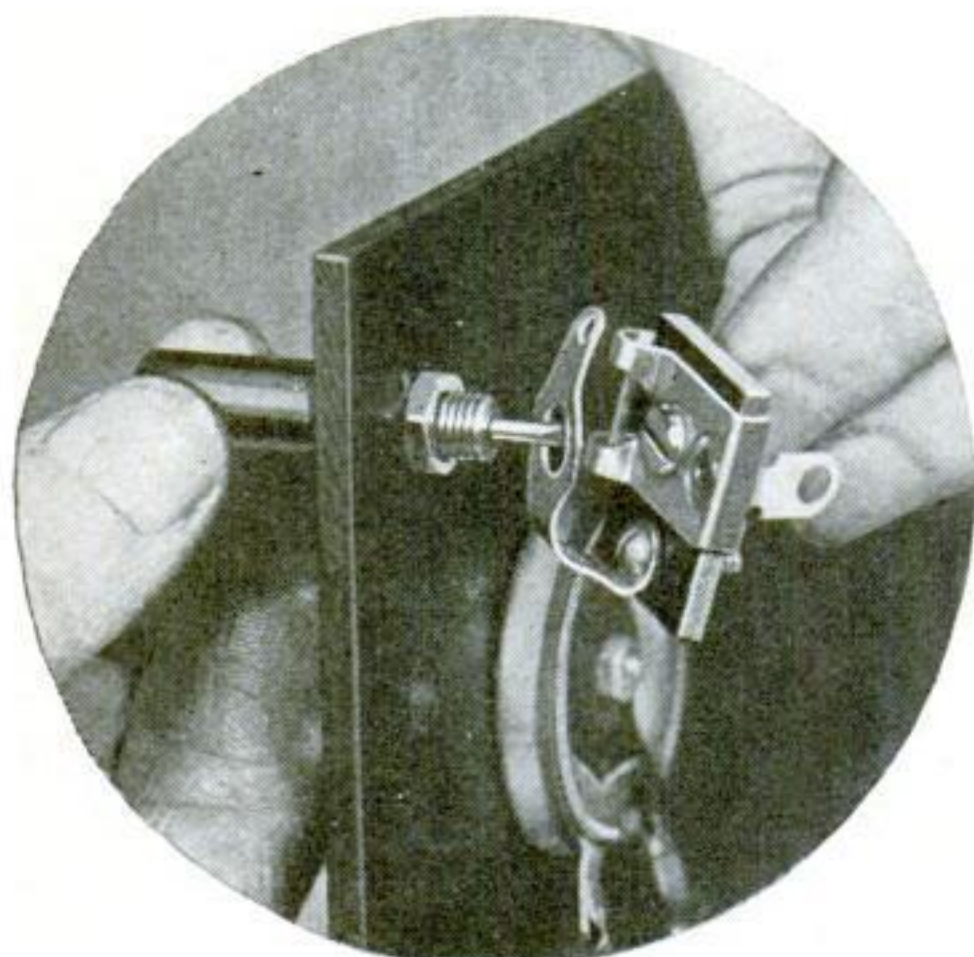
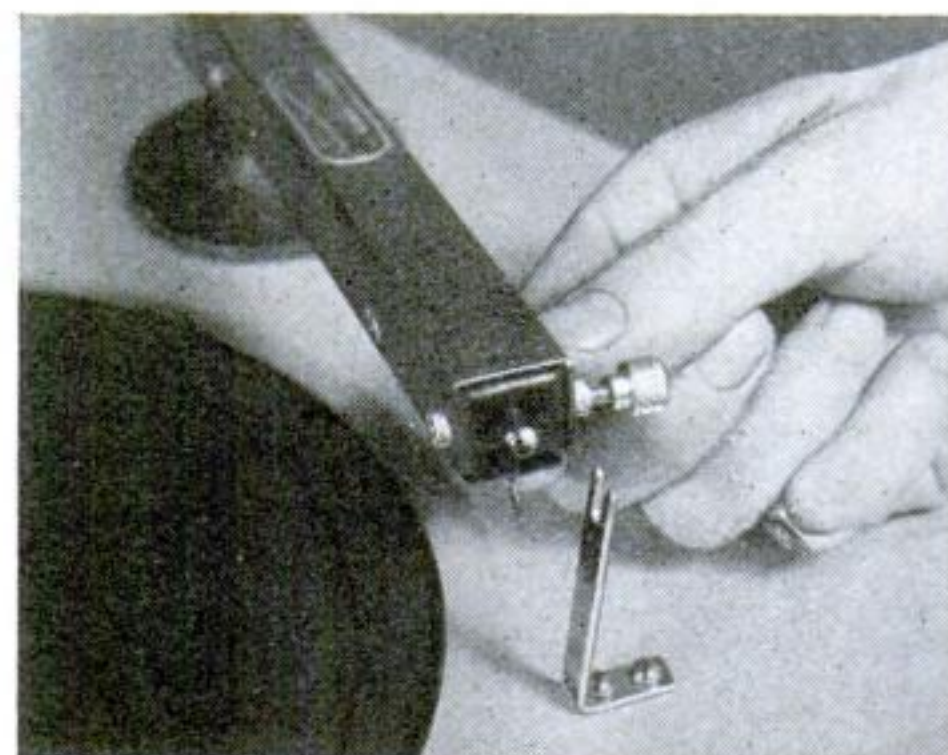


## Rheostat Shafts Are Notched for Cutting

TO SIMPLIFY the problem of cutting the control rods on potentiometers and rheostats to just the right length for panel mounting, one manufacturer now provides long shafts marked with pre-cut notches to guide the saw blade. Placed at convenient intervals, they make it an easy matter to alter the length of the shaft to suit almost any condition.

## Lock for Pick-Up Arm

IN PORTABLE electric phonographs, some means is needed for securing the pick-up arm when the outfit is being transported. One manufacturer provides the simple L-shaped bracket shown below. Mounted to one side of the turntable, the bracket engages an easily tightened bolt on the arm.

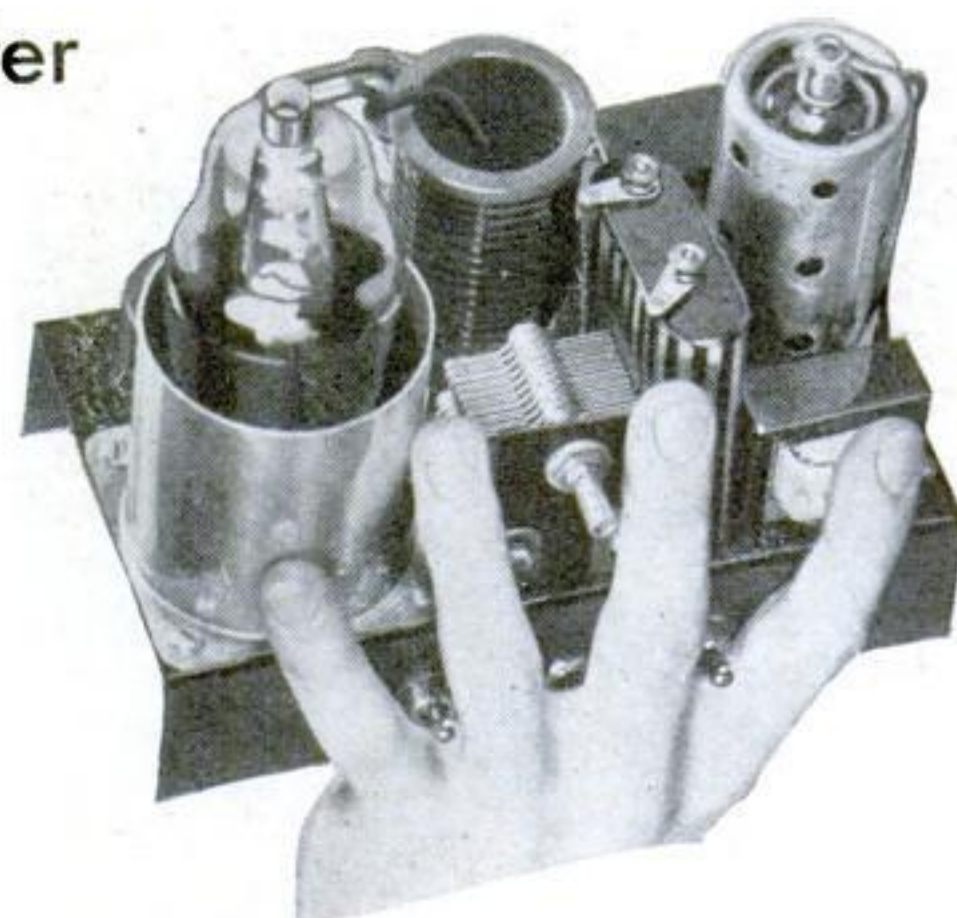


## Handy Condenser Key Made from Jack Plug

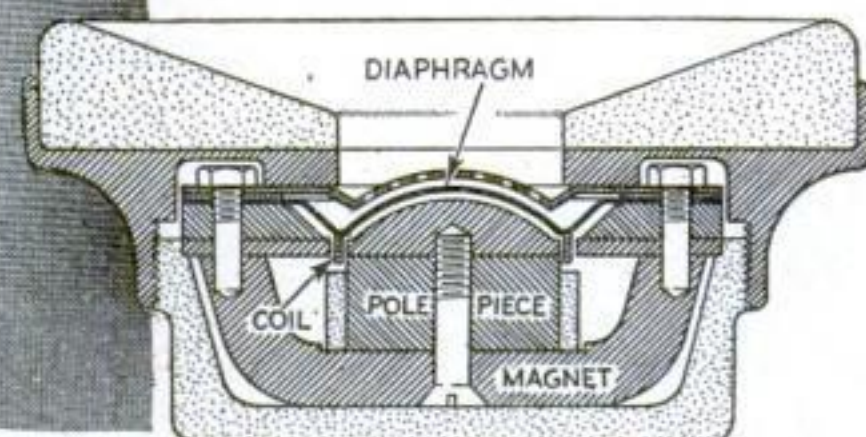
BY MOUNTING the antenna trimmer condenser of your small regenerative receiver on a pin jack as shown in the photograph above, you can adjust it easily with a homemade key consisting simply of an ordinary jack plug ground to a screw-driver point at the end. In use, the plug is inserted through the jack hole in the front panel and turned to either open or close the condenser plates.

## Midget Phone Transmitter

SMALL enough to be held in your hand, the midget crystal-controlled radio-phone transmitter illustrated at the right is especially constructed for use in small privately owned planes or boats. Said to operate over a considerable area and to provide good modulation, the compact circuit employs but two standard tubes which receive their necessary current from a vibrator-type power supply connected to a single six-volt storage battery. Plug-in coils make it an easy matter to change the circuit from one band to another.

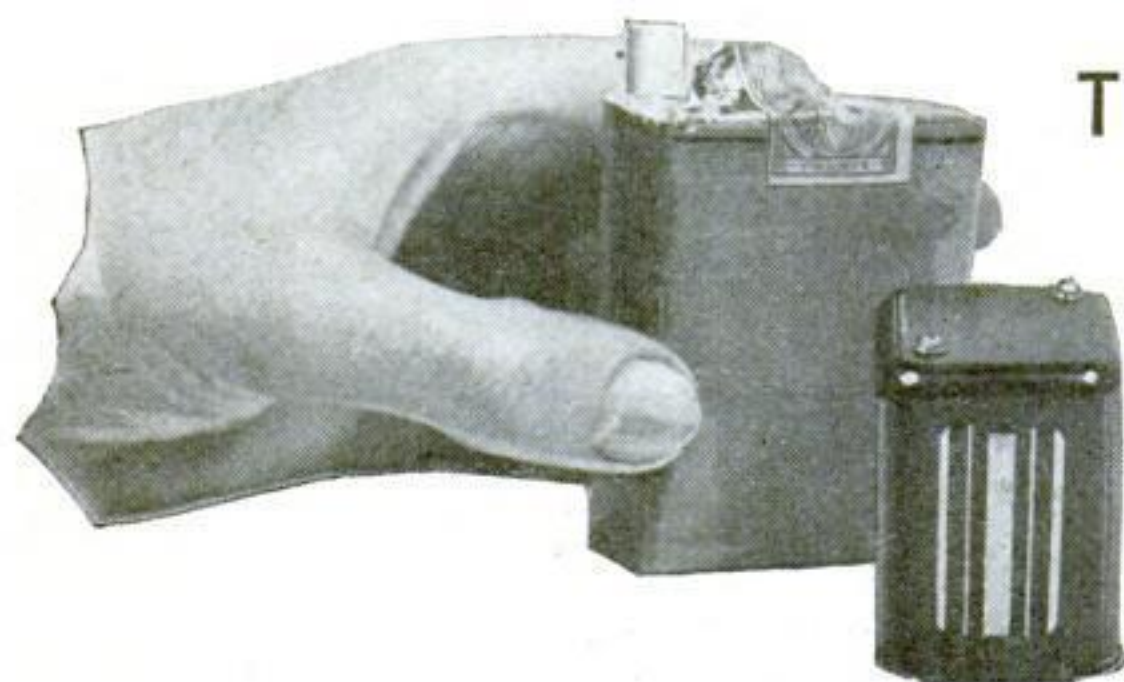


## New Earphones Are Built Like Loudspeaker



## Transformer Is Compact

DESIGNED for use in portable circuits, a new high-fidelity, audio-frequency transformer weighs less than six ounces and takes up less space than a package of cigarettes. Provided with a high-conductivity metal case, the unit is well shielded and provides a frequency response from thirty to 20,000 cycles. The compact transformer is pictured at the left.

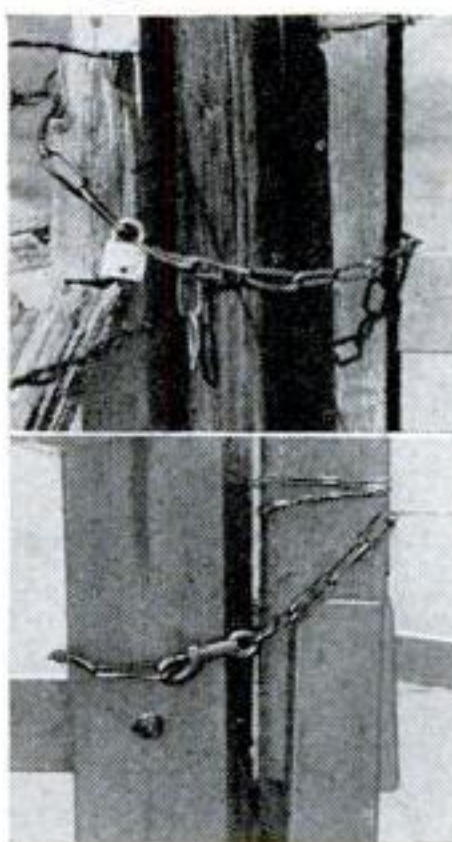


THE tone and quality of a dynamic speaker can now be obtained with earphones. In a new head set now available to amateurs and experimenters, a moving coil of the dynamic-speaker type replaces the conventional diaphragm-and-magnet arrangement. Because they can handle a large amount of power without rattling, the dynamic earphones are particularly valuable for the short-wave fan who prides himself on his ability to bring in the distant stations.

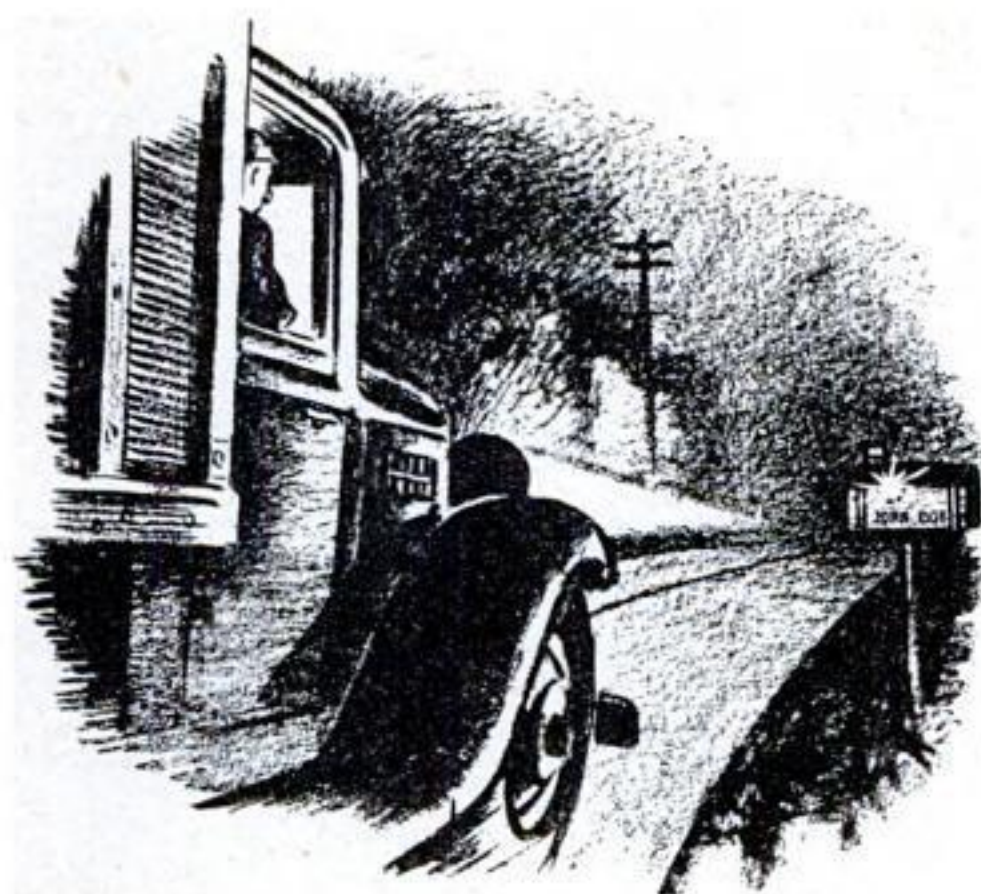


# Padlock on Gate Fools Strangers

A HUNTER or other undesired visitor who comes up to the farm gate illustrated can see at once that it is padlocked and knows he is not wanted on the property. This is quite sufficient in most cases to make him turn back. He never suspects that the padlock is merely a ruse. The farmer himself does not carry a key for it or pay any attention to it. All he does is to reach around to the back of the gatepost and undo an ordinary iron snap, which releases the chain. Two small views at the right show the front and back of the fastening.—FRED MIELKE, JR.



The padlock tells the hunter he is not wanted, but a snap on the far side really unlocks the gate

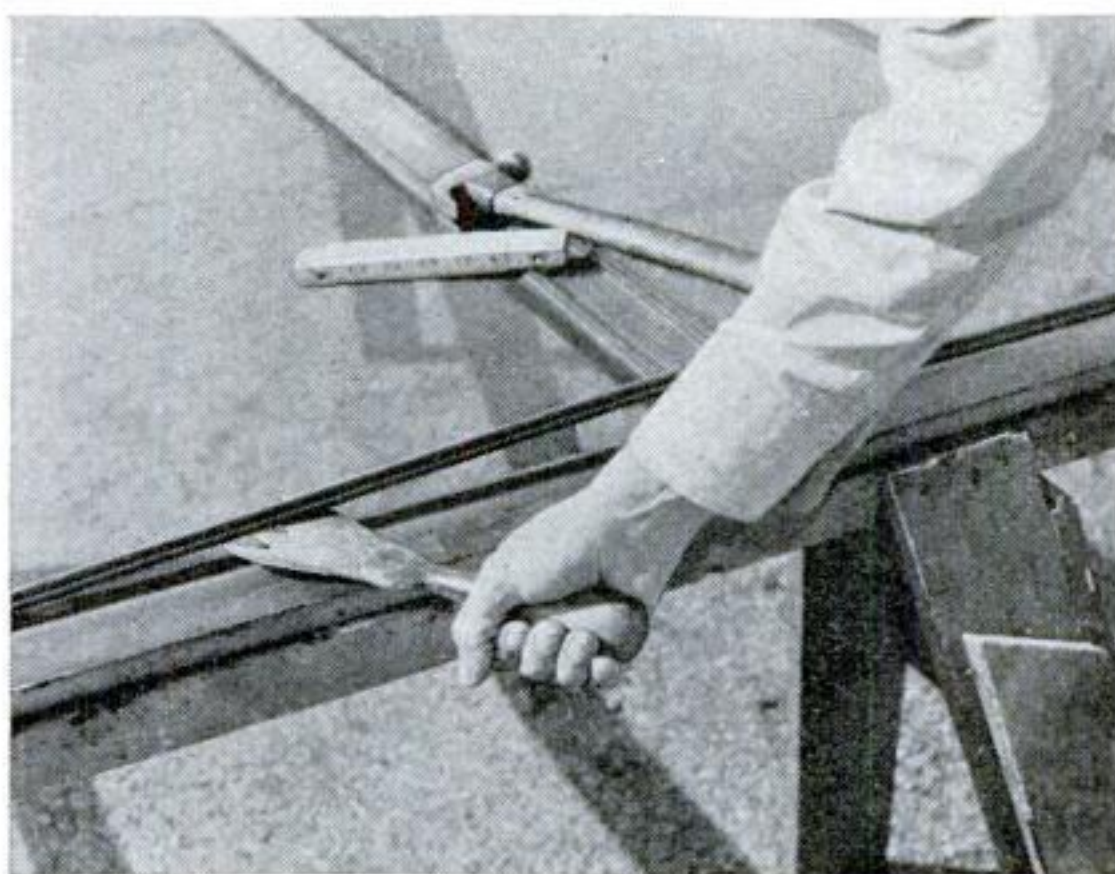


## Reflector on Mail Box Warns Trucks Away

AFTER his rural mail box had been struck several times by the overhanging bodies of large trucks that were traveling close to the edge of the highway at night, one farmer fastened a red glass reflector to the box as a warning signal. The reflector, about 3 in. in diameter, was purchased for a few cents at an auto-supply store. To prevent theft, it was welded to the mail box so it could be seen by approaching traffic.—MORRIS KATZ.

## Ice-Shaving Tool Removes Molding

THE problem of how to get the molding off window or door screens without breaking the strips, when replacing wire netting, can be solved by using an ordinary ice shaver obtainable at the ten-cent store. The prongs on the shaver straddle the nails in the screen mold as illustrated at the right. The nails may or may not be pulled out with the molding, but at least you can get the strip off whole and then easily pull the nails afterward.—T. B. OWENS.



Prongs on the shaver straddle the nails so that the strip can be pried off easily

## Inexpensive Drop Axle for Trailer Body

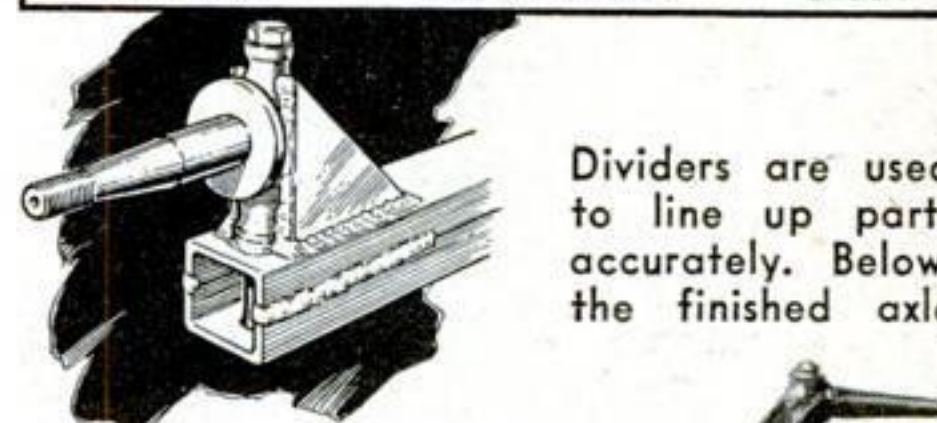
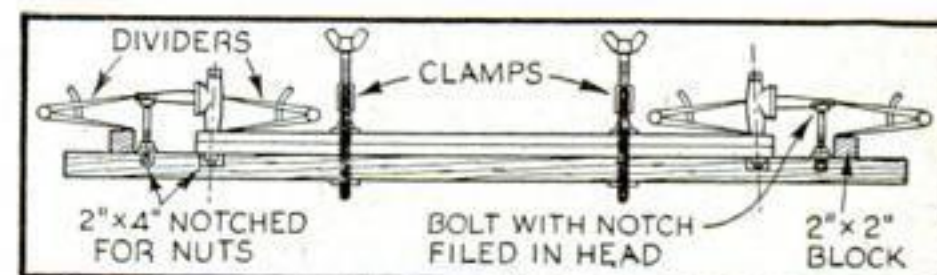
FROM materials costing little more than four dollars, a trailer axle can be constructed that is better in my judgment than the ordinary commercial axle in some particulars. The parts needed are two pieces of channel iron having a 2-in. face and 1-in. legs, four pieces of  $\frac{1}{4}$ -in. iron plate cut into right-angled triangles with both sides  $3\frac{1}{2}$  in., and two auto spindles and king-pins. I used Chevrolet spindles.

First determine the tread desired, keeping in mind that the wider the tread, the more stability and less side sway. Assemble wheel, tire, hub, and spindle to ascertain the distance from the center of the tire to the center of the king-pin hole. Then cut the channel the desired tread less twice the above distance plus  $2\frac{1}{2}$  in. Clamp channels together, legs to legs, and tack with a spot welder, if available. Drill holes through channels  $1\frac{1}{4}$  in. from the ends and  $\frac{1}{32}$  in. larger than the king-pin. This allows for the fact that the king-pin and spindle are not at right angles.

Assemble spindles, channels, and

king-pins, merely tightening the nuts on the latter with the fingers. Line up the spindles as shown in the sketch. Turn the nut on the bolt until the distances from lathe centers of spindle to top of channel and block are exactly the same.

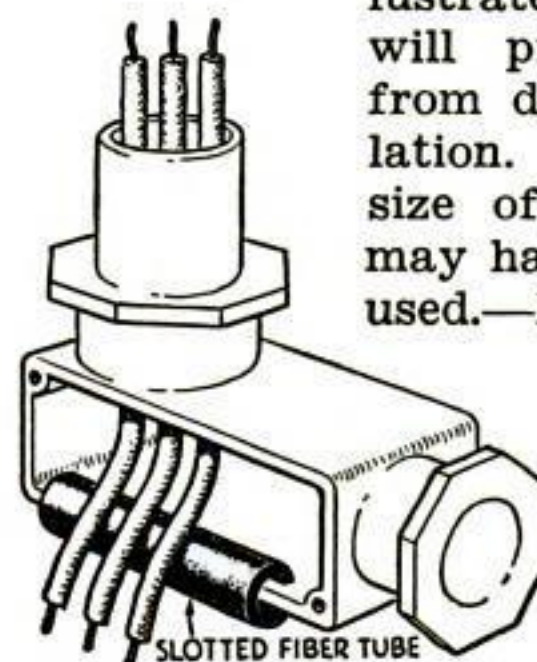
Hold a straightedge alongside the assembly and as near the centers of the spindles as possible and, using dividers, make all distances from centers to straightedge the same by slightly twisting spindles on king-pins. Tighten king-pins gently and clamp the triangular plates to sides of spindles. Weld with the jig in place.—W. J. FLETCHER.



Dividers are used to line up parts accurately. Below, the finished axle

## Fiber Guard for Wiring

WHEN pulling wire or cable into the open side of a conduit fitting, a slotted fiber tube slipped over one edge as illustrated in the drawing will prevent that edge from damaging the insulation. Any convenient size of fiber tubing you may have at hand can be used.—RUSSELL M. REED.



The fiber tubing on the edge of the fitting saves insulation from damage



# YOU, TOO, CAN Photograph Children

## LIKE AN EXPERT



By REGINALD O. LISSAMAN

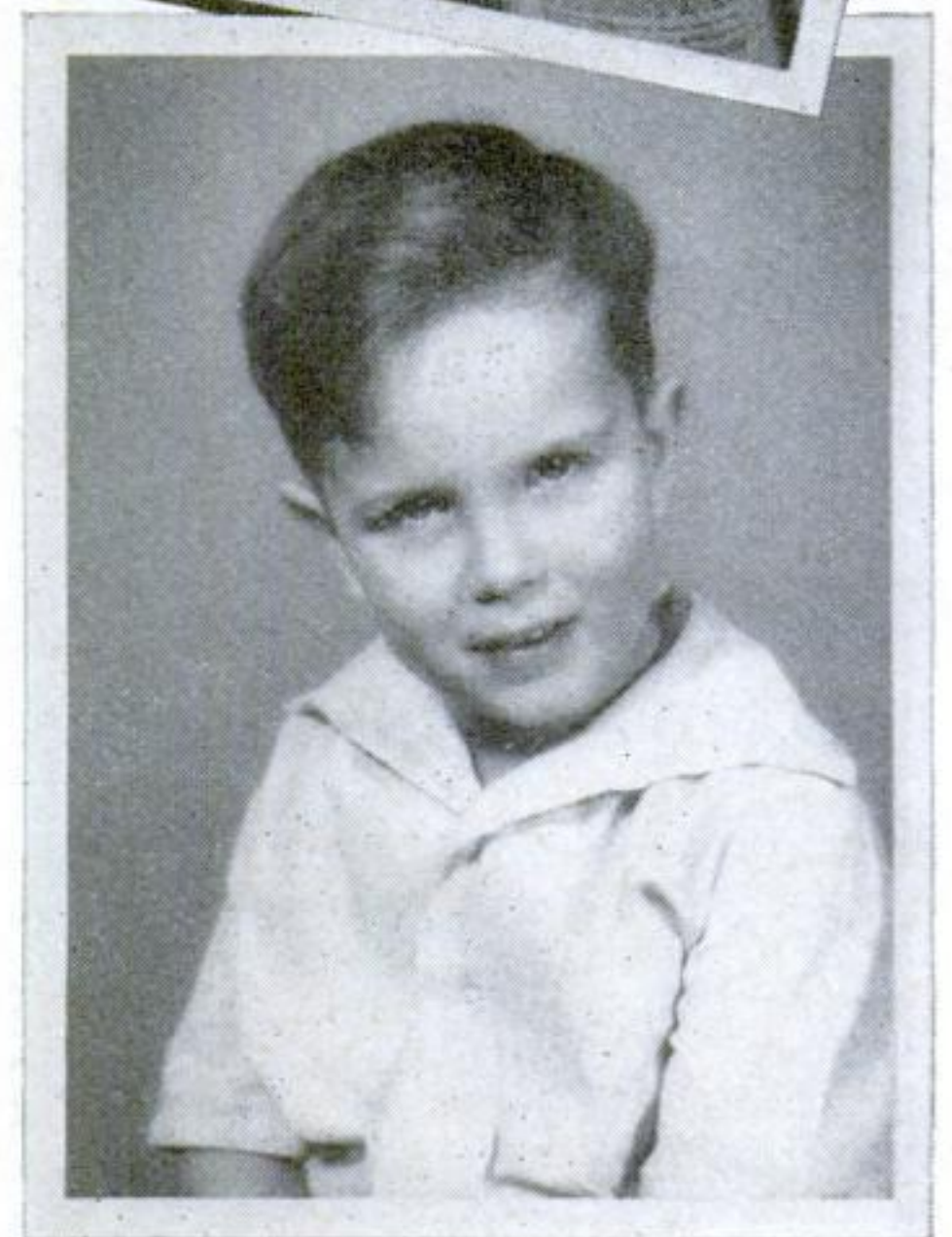
**P**HOTOGRAPHING children is a fascinating pastime, and it can also be made to pay good dividends. Given a fair camera and a little homemade equipment, any amateur familiar with the fundamentals of picture making should be able to turn out child story-telling pictures and portraits surpassing those of the average professional. While the amateur's results may for a time lack the finish of the expert, he can catch the spontaneity of expression that is so hard to get from a child in the strange environment of the studio.

All three accompanying illustrations were taken in my own home with purely amateur-type equipment, and while some of their beauty is due to fair technique, their attraction lies mainly, as you may see, in the beauty of expression, unposed and natural.

If you own a camera of the simpler type that permits focusing only at distances greater than six feet, you should obtain a portrait attachment. This is an auxiliary lens which slips on over the regular lens and

permits focusing as close as thirty inches. They come in both regular and diffusion types, complete with tables of distances and camera settings. While diffusion may be introduced later in printing from the negative, the diffusion obtained at the original exposure possesses a particular beauty of its own and also tends to soften some of the photographer's errors of harsh lighting. When, however, the attachment is to be used for other work as well as portraits, the regular type is the best to buy. The picture of the two children was taken through the regular attachment, while the portrait below it was taken through the diffusion type. Note the slight

The study above by Mr. Lissaman has been hung at various photographic salons, here and abroad. The data: 1/25 second at F/6.3. Four No. 1 photofloods in pairs; diffusion screens over reflectors



Portrait taken with same speed, stop, and lights, except No. 2 photoflood lamps were used. Both photos were made with an old roll-film camera, adapted to use cut film



"Quite Happy." Here the lights were at almost equal distances on either hand from the sitter. As the lights approach this position, the modeling is given flatter rendering

softening of detail in the latter picture.

The film used for this work should preferably be of panchromatic type, since even the brilliance of photoflood lamps is low in photographic light, when compared to the sun.

All the illustrations were taken with photofloods. Information and tables regarding their use are obtainable at almost any shop that sells film. The No. 2 size is more economical than the smaller No. 1 lamps. A reflector should be used. My reflectors each hold two bulbs, and I use two reflectors. Regardless of what type of reflectors you have, each should be equipped with a diffusion screen. This is made from a piece of very *(Continued on page 110)*

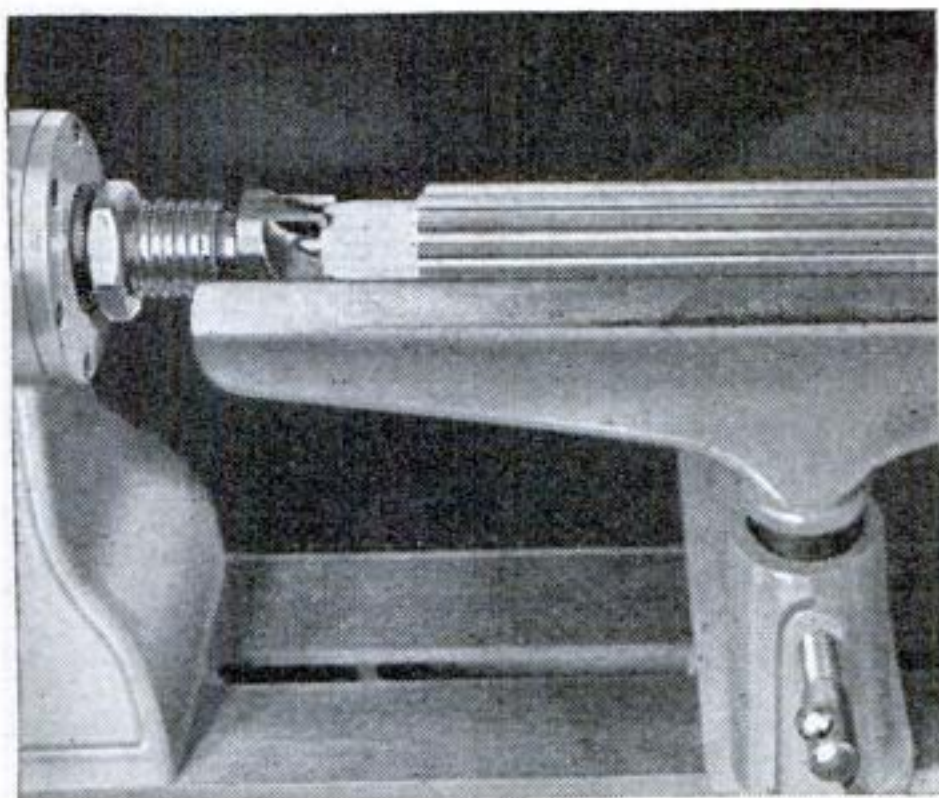


## Sleeve Wood Turning

(Continued from page 71)

sleeve block may be slipped upon the centerpiece and glued. When the glue has hardened, the sleeve is turned to size, and the procedure repeated for all the different sleeves. After the cylinder has been completed in this way, it is shaped in the usual manner.

For the construction of the small furniture bench leg used as an example, one centerpiece and two sleeves are required. These sleeves are in two sections, which are separated by a block into which the side rails fit. Another



Fluted turning ready for finishing. Note how the wood of the core has been laid bare

block of the same size is placed at the top of the turning.

The center sections of the sleeves are turned and glued first. The lower one of the blocks has a hole drilled completely through it, but the top one is bored only half of its length. Since only the most expert workers can drill these holes accurately, the blocks should be larger than their finished size. When they have been drilled, they are slipped over the end of the centerpiece and the turning clamped in the miter gauge of the circular saw, as shown. By passing the end of the block through the saw, it will be cut at right angles to the hole. With this one square side as a guide, the remainder of the block can then be cut to the required size.

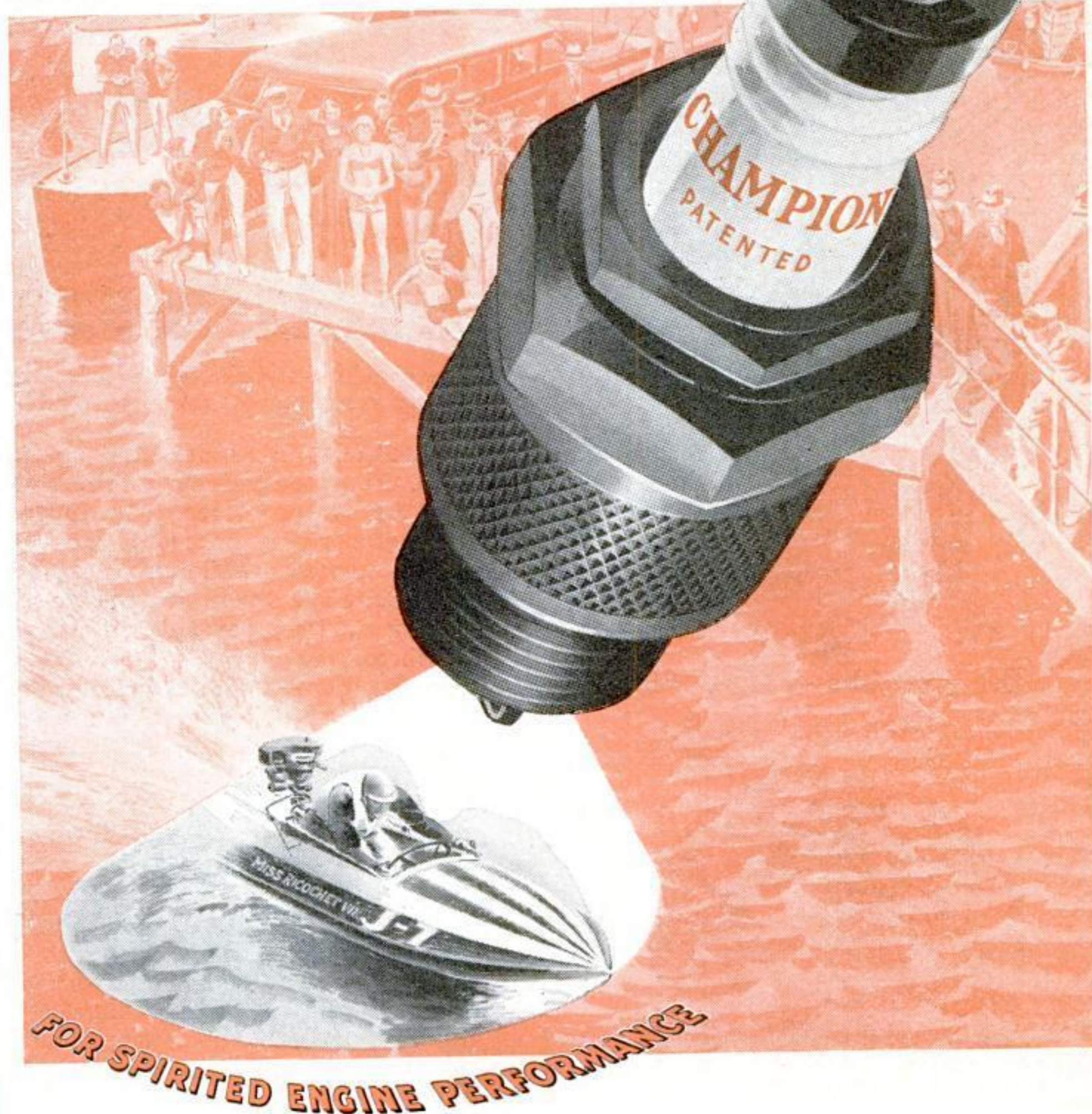
The location for the lathe center in the top block can be found by drawing cross lines. The work is then assembled and glued. Before the glue hardens, it is necessary to true the rail blocks in relation to each other, so they are placed across two strips of wood on a true surface and a slight pressure is applied. When dry, the work is turned to the required pattern.

A very attractive two-tone effect can be obtained by fitting one sleeve to a centerpiece and then fluting it on a shaper. The sleeve should be thin enough to allow the cutter to lay bare the wood of the centerpiece.

## Boring Rubber Stoppers

WHEN it is necessary to bore a hole through a rubber stopper with a cork borer, time and trouble may be saved by keeping the end of the borer wet with a caustic soda (sodium hydroxide) solution.—M. C. BLANCHER.

## YOU CAN DEPEND ON CHAMPIONS



When an outboard racing driver guns his eager, whining mount across the starting line, his hopes are firmly pinned on a few all-important factors in his engine—not least among them spark plugs—to see him first across the finish line.

Like most racing drivers who look only for the utmost in dependability and performance from their spark plugs, the champions of outboard racing, almost without exception, use Champions exclusively. Douglass C. Fonda, sensation of the 1937 outboard racing season, achieved a record such as has never before been compiled by a single driver in one year. Winner of three national awards, he always uses Champions "because of their absolute dependability."

Every engine, whether automotive, aircraft, marine, truck, tractor or stationary,

will perform better with Champion Spark Plugs. 27 years of ceaseless engineering and research, devoted exclusively to the constant betterment of the one product manufactured by Champion, have made this a fact. Demand Champions for your car because you can depend on them. Wherever you find good service you will find a Champion dealer.

### Champion "V" Spark Plugs



3/8", 24 Thread  
Actual Size, 65c

Specially designed for model gas engines giving the same dependable performance as regular Champions. Absolutely gas-tight, alloy needle point electrode, one-piece construction. If not available through your dealer, write Champion Spark Plug Company, Toledo, Ohio.

**CHECK AND CLEAN SPARK PLUGS WHEN YOU CHANGE OIL**



# UNRULY HAIR

*Stays Neatly Combed*



**Even Stubborn Hair Will  
Stay In Place**



**Costs But A Few Cents To Use  
— a bottle lasts for months**

**I**S YOUR HAIR difficult to keep in place? Does it lack natural gloss and lustre? It is very easy to give it that rich, glossy and orderly appearance so essential to well-groomed boys.

Just rub a little Glostora through your hair once or twice a week — or after shampooing, and your hair will then stay, each day, just as you comb it.

Glostora gives hair that natural, rich, well-groomed effect, instead of leaving it stiff and artificial looking as waxy pastes and creams do.

Try it! A large bottle of Glostora costs but a trifle at any drug store.



**Glostora**

## Workshops Started by Guild Clubs

*(Continued from page 78)*



Mexico (Mo.) Homecraft Club with projects and tools that formed part of an exhibit

demonstrations, literature, and special services. Fourteen percent of the clubs meet in hardware stores. The largest number (forty-one percent) meet in members' homes. Although fifty-one percent stated women sometimes attend, only thirteen percent have women members.

There is, however, one club composed entirely of women—the *Gila* (N. Mex.) Homeworkshop Guild. It was organized last fall by twelve women who met at the home of Mrs. Arthur Northrup. Mrs. Northrup is president; Mrs. Adrian Bumgardner, vice president; Mrs. A. L. Barnett, secretary-treasurer. Sixty children were given toys and candy at Christmas.

The Staley Handicraft Club, *Dectatur, Ill.*, is growing rapidly. Ten members joined at one meeting, bringing the total membership to more than seventy.

A junior auxiliary is being organized by the *Montgomery* (Ala.) Handicraft Club . . . Three members of the *London* (Ont., Canada) homeworkshop Club are making their own lathes . . . President Earl Scothorn demonstrated how to use the jig saw and wood-turning lathe for the Fort Stanwix Hobby Club, *Rome, N. Y.* . . . The Build-Our-Own Homeworkshop Club, *Natrona, Pa.*, is installing a club workshop in a garage.

Charles Krause was host to the *Saginaw* (Mich.) Homecraft Club in his workshop. New officers are C. S. Kolb, president; Merle Hedrick, vice president; L. E. Foglesong, secretary; Ernest Deford, treasurer; William J. Klenke, librarian. T. J. Paquette, George Parent, and the officers form the board of governors . . . Demonstrations of making wooden statuettes, shaping oval picture frames, and upholstering were given at a meeting of the *Oklahoma City* (Okla.) Homeworkshop Club . . . The *Toledo* (Ohio) Homeworkshop Club was formed recently at the home of H. E. Stalker. The second meeting took place at a hotel, and various types of craftwork were exhibited . . . A total of 250 toys were made by the *St. Joseph* (Mo.) Homeworkshop Club and turned over to the Boy Scouts for distribution. New officers are W. F. Simmons, president; Ray Harvey, vice president; Hartlie O.

Davis, secretary-treasurer; Everett Elkins, librarian.

After incorporating last summer, the *Leroy* (N. Y.) Homeworkshop Club purchased an old house, which at present is being remade into a club workshop and an apartment. There were 39 entries, 13 more than last year, in the club's second annual exhibition.

Officers of the *Chaska* (Minn.) Homeworkshop Club are William Betchel, president; Arnold Lambrecht, Jr., secretary; Oliver Rekow, Jr., treasurer . . . Charles Johnson demonstrated pottery making and A. W. McIntosh finished a sundial in bronze before the Mazda Homeworkshop Guild, *Euclid, Ohio* . . . Although most clubs are interested in woodworking, the *Hardwood* Homeworkshop Club, *Neenah, Wisc.*, reports that by the end of this year at least eighty-seven percent of the members will own metal-working machinery . . . The *Shenango Valley* Homeworkshop Club, *Sharon, Pa.*, is conducting a membership drive . . . A great deal of interest in the home workshop hobby was created by a display



Annual exhibit of the LeRoy (N.Y.) Homeworkshop Club in a hardware store window

of the *Mexico* (Mo.) Homecraft Club in a local hardware store . . . New officers of the *Yakima* (Wash.) Homecraft Club are Everette R. Small, president; A. J. Stephens, vice president; R. L. Mashburn, secretary-treasurer; Earl C. Brown, librarian . . . The *Witch City* Homeworkshop Club, *Salem, Mass.*, is specializing in building models.

The *Niagara* Homeworkshop Club, *Niagara Falls, N. Y.*, has purchased a screw-cutting lathe for its club workshop. Officers are K. Gifford, president; R. Klettke, vice president; H. W. Stegman, secretary; W. Klettke, treasurer; D. Romberg, librarian.

Theodore F. Herbert has been elected president of the *Gem City* Homeworkshop Club, *Dayton, Ohio*. Other officers are George Sanders, vice president; Victor R. Shuttleworth, secretary-treasurer; Lesley Armstrong, sergeant-at-arms . . . Projects made by members of the *Ware* (Mass.) Homeworkshop Club in one month include the following: Plaque of Guild emblem, made by E. Gosselin; canary breeding cage, R. Bouvier; serving tray, L. Mozdzierz; model of circus wagon, Thomas Moriarty . . . The Homecraft Club

*(Continued on page 99)*



## Clubs Start Workshops

(Continued from page 98)

of **Pittsburgh, Pa.**, has increased its membership to 348 men . . . A clam boil was held for members of the Timber Craft Homeworkshop Club, **New Bedford, Mass.**, and their wives recently.

Members of the Bison Homeworkshop Guild, **Buffalo, N. Y.**, are remodeling the newly acquired clubroom and making furniture for it. John P. Cleary lectured on aluminum recently. The club delivered 475 toys to 128 families last Christmas.

W. T. Baxter, art metal and jewelry instructor at Woodrow Wilson High School, **Washington, D. C.**, demonstrated gem cutting and jewelry making for the Capital Homecraft Club. The annual exhibit was held in February . . . James Arnish has been elected president of the Sunset Social and Hobby Club, **Brooklyn, N. Y.**; Bennie Amodeo, secretary; Robert Bahlin, treasurer . . . Under the direction of Gladfred Viery, the **Niles (Calif.)** Homeworkshop Club entertained the Arts and Crafts Club. An exhibition was held in March . . . The **Fall River (Mass.)** Homeworkshop Club plans to hold its annual exhibition in June . . . Talks on hardwoods, operation of the table saw, and inlaid pictures were given at a recent meeting of the **Seattle (Wash.)** Homeworkshop Club . . . Officers of the **Peekskill (N. Y.)** Homeworkshop Club are Herman MacPeck, president; Lester D. Jessup, vice president; Harry Rigby, Jr., secretary; Arthur A. Dix, treasurer. The annual exhibition was held in March . . . A survey of the **Ware (Mass.)** Craftsman Guild shows that nearly half of the members own power equipment.

Recent meetings of the Tri-City Homeworkshop Club of **LaSalle, Peru, and Oglesby, Ill.**, have included talks by J. C. Rucinski on leather work and Paul Repka on plastics . . . The Edison Homeworkshop Club, **Chicago, Ill.**, has completed plans for its annual craftsmanship contest on April 21 . . . Officers elected by the **Fargo (N. Dak.)** Homecraft Guild are Arthur Malme, president; J. L. Woodward, vice president; John C. Pollock, secretary-treasurer; Gunnar Helland, librarian; Leland Patten, governor for three-year term.

The Y. M. C. A. hobby show of which the **Lincoln (Nebr.)** Homeworkshop Club was cosponsor was so successful that hereafter the club will sponsor it. There were 134 exhibitors with 283 items entered. Approximately 2,000 persons attended. The members have completed their ottomans and are taking up archery this spring.

## How to Start a Club

COMPLETE information on how to start a home workshop club in your neighborhood is yours for the asking. Address the National Homeworkshop Guild, 347 Fourth Avenue, New York, and inclose a large (legal size), self-addressed, and stamped envelope.

**OL' JUDGE ROBBINS**  
AT COLONIAL WILLIAMSBURG, VIRGINIA

HOW COULD ANYONE TELL WHAT WILLIAMSBURG LOOKED LIKE IN PRE-REVOLUTIONARY DAYS? WELL, FOR ONE THING, THEY WERE GUIDED BY RELICS WE'LL SEE IN THIS OLD COURTHOUSE. THERE'S KEN WAITING FOR US.

THESE MUSEUM EXHIBITS WERE DUG UP FROM THE RUINS OF BUILDINGS DATING AS FAR BACK AS TWO CENTURIES. HERE'S AN INTERESTING CASE, DAD!

PART OF RESTORED DINNER SET, ORIGINALLY DESIGNED BY JOSHUA WELCHWOOD.

IT'S HARD TO BELIEVE THAT A WHOLE DINNER SET COULD BE RECREATED FROM THOSE SMALL FRAGMENTS OF CHINA, BUT THAT'S WHAT WAS DONE. EVERY SPAREFUL OF EARTH WAS CAREFULLY SIFTED.

REPRODUCTIONS OF COLONIAL SILVERWARE.

AN EXCITING FIND WAS A SMALL SILVER COFFEE SPOON THAT GAVE THE KEY TO A COMPLETE COLONIAL SILVER SERVICE.

THESE CURIOUS 'H' AND 'L' HINGES ARE VERY POPULAR NOW. THIS PANEL SHOWS REPLICAS OF SOME FOUND ON THE SITE OF THE GOVERNOR'S PALACE.

I RECOGNIZED YOU, JUDGE ROBBINS. WHAT DO YOU THINK OF THIS CHURCHWARDEN PIPE? IT WAS DESIGNED FROM A PIPE BOWL FOUND IN THE DIGGINGS.

VERY INTERESTING. THAT LONG STEM TELLS THE STORY OF HOW THEY TRIED TO GET A COOL SMOKE IN THE OLD DAYS.

WELL, NOWADAYS WE HAVE A BETTER WAY TO KEEP OUR SMOKE COOL AND MELLOW, EH, JUDGE?

I SHOULD SAY SO. PRINCE ALBERT CERTAINLY HAS SOLVED THE PROBLEM OF GETTING A MILD, COOL SMOKE!

Copyright, 1938, R. J. Reynolds Tobacco Co.

**THEY'VE ALL FOUND THE KEY TO  
MORE SMOKING JOY!  
—A Milder Pipe Tobacco That's Tastier Too!**

**RICH TASTE**  
COMES FIRST WITH  
**ME. PRINCE ALBERT IS**  
**FULL-BODIED, YET**  
**NEVER HARSH**

**TRAINMAN**

I CAN PAY THE PRICE OF ANY TOBACCO, BUT PRINCE ALBERT HITS ME RIGHT FOR MILDNESS —IT'S NO-BITE TREATED!

**CONTRACTOR**

I FIGURED OUT WHAT ASSURES BETTER PACKING AND DRAWING AND MELLOWER SMOKING. SO I SWITCHED TO P.A. —IT'S CRIMP CUT

**SCIENTIST**

**BETTER—OR  
IT'S OUR TREAT!**

Smoke 20 fragrant pipefuls of Prince Albert. If you don't find it the mellowest, tastiest pipe tobacco you ever smoked, return the pocket tin with the rest of the tobacco in it to us at any time within a month from this date, and we will refund full purchase price, plus postage. (Signed) R. J. Reynolds Tobacco Company, Winston-Salem, N. C.

**PRINCE ALBERT** THE NATIONAL JOY SMOKE





## HOW A SIMPLE TRICK MAKES SHAVING EASY

● Blackstone, master magician, says: "Making whiskers disappear like magic is one of the easiest tricks on earth. Just slip a Gillette Blade in your Gillette Razor and—presto—you've got the closest, longest-lasting shave money can buy. Shave the Gillette way and your face feels the difference. What's more, it *shows* the difference—looks cleaner and smoother—for hours!"



● A few passes whisk away Blackstone's steel-gray stubble quickly and cleanly. You don't have to be a magician to duplicate this feat. Simply use a Gillette Blade in a Gillette Razor. You'll get the world's best shaves for *less than one cent a day*.

**GILLETTE'S New Brushless Shaving Cream**

Prepare your beard for perfect shaves with Gillette's New Brushless Cream. Made with peanut oil, it softens wiry whiskers, stays moist, speeds shaving, won't clog your razor. Try a tube. You'll like it!

**LARGE TUBE ONLY 25c**

**LESS THAN 1¢ A DAY** buys the world's finest blades

PRECISION—MADE FOR EACH OTHER

**Gillette Blades**

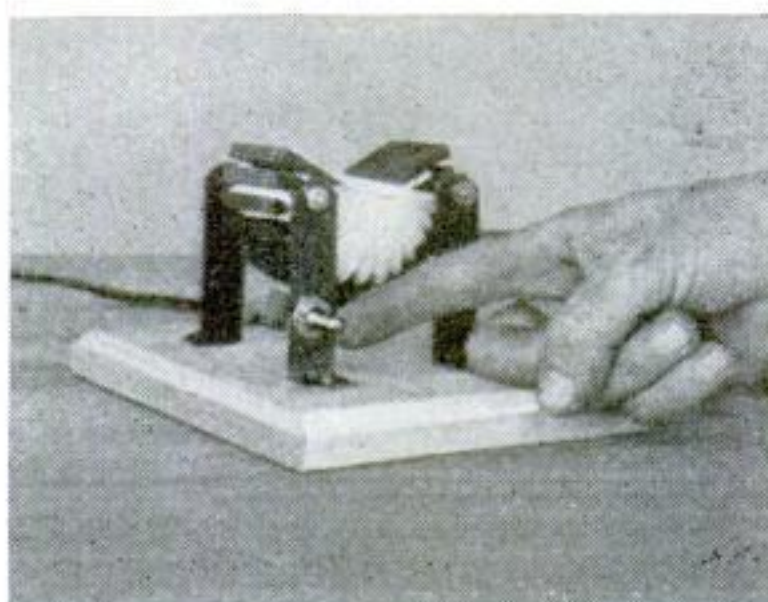
MORE SHAVING COMFORT FOR YOUR MONEY

# SMALL "GROWLER" Armature Tester

wound on core from old auto generator

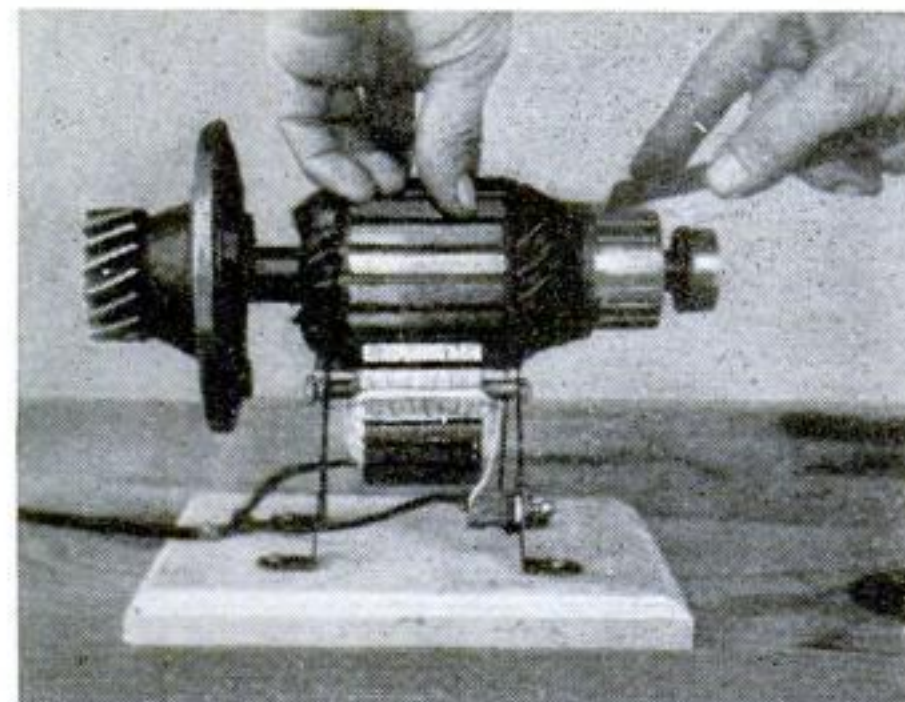


FIG. 1



The laminations from an old auto generator are cut and stacked on metal dowel pins

At left, the test unit completed, showing position of toggle switch on one of the legs of the instrument



How an armature is placed on the tester and a metal feeler used to locate an open circuit

way while the winding is done, they must be left off until later.

Replace the fiber insulating strips in the slots and wind the core. This is done with No. 22 or 24, B. and S. gauge, double cotton-covered wire. About 300 turns will be enough, and they should be distributed as evenly as possible in the slots between the clamp bolts. Do not let the wire hump up above the central hole so that an armature being tested will rest on it. It may be necessary, in

case larger wire than No. 24 is used, to substitute thin oiled or varnished paper for the thicker fiber strips. In any case, use some kind of insulation between the core and the windings.

The legs are formed from rather heavy gauge steel strap. Mount the unit on a wooden baseboard with screws. A line switch is also required. It may be of the toggle type, mounted in a 1/2-in. hole in one of the legs.

As the method of using an armature tester is rather well known, it will be

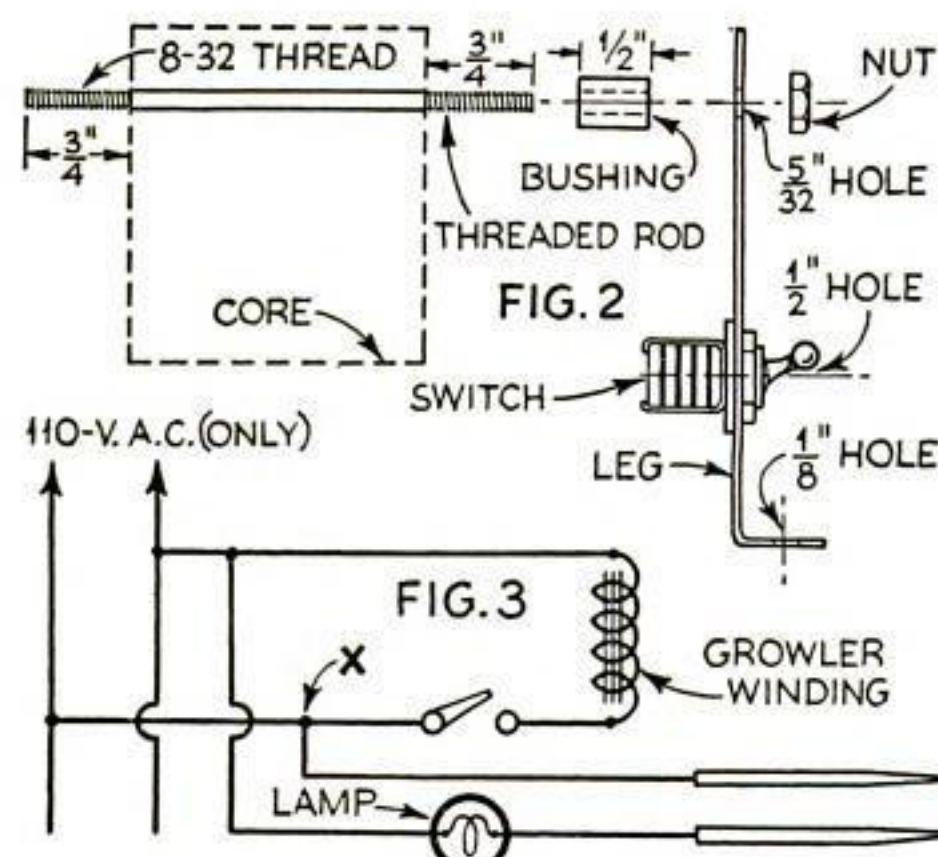
WITH this armature-testing unit or "growler," it is a simple task to find the reason for the sluggish operation of an auto generator, starting motor, electric drill, or any small commutator-type shop motor.

The growler core is made from the armature core of a discarded auto generator. Remove the coils from the core, drive out the shaft, slip out the fiber insulating strips in the slots and, with a pair of tin shears, cut away about one third of each lamination, leaving the part to be used in the final assembly like those shown in the drawing above. The fiber end pieces should also be cut to this shape.

A good form to use in reassembling the laminations consists of two long metal dowels driven into a board (Fig. 1). Put one of the fiber end plates in place first and follow up with all the steel laminations, ending with the other fiber plate.

Take the assembly from the board, bringing the dowels up with it, and clamp in the vise. Remove the dowels and put in their places two lengths of steel or brass rod, threaded on each end with an 8-32 die. These rods, shown in Fig. 2, should be 1 1/2 in. longer than the assembled core.

Make four metal bushings, 1/2 in. long, place them over the protruding ends of the rods, and apply nuts tightly to keep the laminations from spreading. These nuts will have to be removed after winding so that the legs of the tester can be applied, but as the legs would be in the



X—CONNECT TEST LEAD ON LINE SIDE OF GROWLER SWITCH AS GROWLER IS NOT ENERGIZED WHEN LAMP IS USED

Wiring diagram of growler, test prods, and lamp, and, above, the front leg and switch



mentioned only briefly. Additional information can be obtained, when required, in an automotive manual or from your auto mechanic.

The armature is placed over the pole faces of the unit and the current turned on. This causes the familiar hum or growl which gives rise to the name of this type of tester. Hold a thin steel strip, such as a hack-saw blade, over the armature coils and slowly rotate the armature with the other hand.

If the blade is attracted strongly to the armature at some certain position, it indicates that the coil directly between the pole faces is shorted. If this is the only place where the attraction takes place, it means that the short is between two or more turns of this one coil. If, however, the feeler is attracted by two or more coils, one of these coils is very probably shorted by the other.

The feeler is also used to test for an open-circuited coil. One of the photographs shows this test being made on a generator armature. Use the feeler to short-circuit adjacent bars around the commutator. If, on breaking the contact, a heavy spark is noted, pass on to the next pair, as the spark indicates a closed circuit; otherwise look for a break in the coil connected to the bar.

Grounds between coils and core sometimes occur. To test for these, a pair of test prods and a lamp are needed. These were not incorporated in the unit made by the writer, but may be added to the baseboard if desired. The wiring diagram (Fig. 3) shows how they are connected. In this test, the growler switch is turned off and the test lamp circuit used alone. One prod is held on the armature shaft while the other is touched to each commutator segment in turn.

There are two armature faults that are hard to detect. Sometimes the heat developed in running will cause a short in an armature, and when placed on the growler for test will show clear. The time taken up in removing the armature from the machine and placing on the unit will be enough for the armature to cool off and clear up the fault. Obviously, heating the armature just before testing is the method to use in a case of this kind. Then again, the centrifugal force exerted on the coils while running may cause a short that doesn't show up in a stationary test.

As a final word, don't turn on the "juice" before putting the armature in place, and always turn off the switch before removing it.

### Brass Ring Aids in Making Ground-Glass Screens

FOR photographic and experimental purposes, a piece of ground or frosted glass is often required. Here is a quick and easy method to prepare it: Obtain a heavy brass ring about 1 in. in diameter with about a  $\frac{1}{2}$ -in. hole, although the dimensions are not important. Place it on the sheet of glass and put a small quantity of powdered abrasive inside the ring. Add water to make a thin paste and start grinding by moving the ring in small circles. More abrasive and water must be added from time to time when you feel an adhesion between the ring and the glass.

For an extra fine-grain screen to use with your microscope, start with a coarse grit and grind until you remove the polish; then wash the glass and ring thoroughly and use a finer grit for finishing. The best abrasive for the finer screens is regular optical emery, grit No. 303 being satisfactory.—J. E. G.

# New Principles in Hearing Aids



**W**ESTERN ELECTRIC'S new Audiphone is not just an improved version of an old model. This Ortho-technic Model is brand new—built on *entirely different principles* in hearing aid design that bring you hearing ease impossible till now!

Developed by scientists at Bell Telephone Laboratories, this remarkable instrument at last enables you to **Hear clearly** and enjoy group conversations once more; **Hear in any position**—there's no "cut-off" when you lie down or recline;

**Widen your hearing circle**—hear distinctly at much greater distances;

**Enjoy natural tone**—with *greater volume* than in any previous aid;

**Reduce bother and expense** in connection with batteries—they last much longer.

A variety of combinations enables your dealer, after an Audiometric test, to recommend a hearing aid—with either air or bone conduction receiver—that will meet individual requirements. Send the coupon today for booklet giving full details.

**THE NEW**  
*Western Electric*  
**HEARING AID**  
Ortho-technic Model

GRAYBAR ELECTRIC CO., Graybar Bldg., New York

Please send details on New Western Electric Audiphone (Ortho-technic Model) and name of nearest dealer. PS-35

Name.....

Address.....

City.....State.....



I'LL FIX THAT  
IN A JIFFY!



## Canned Wood Makes Home Repairs Easy

Anybody can do a fine job of repairing quickly—

- broken chairs
- loose casters
- holes in wood
- nicks
- cracks
- screw holes
- loose drawer pulls, etc.

with this canned wood that handles like soft putty and quickly hardens into wood you can drive nails and screws into, paint, or carve. Paint, hardware and 10¢ stores sell PLASTIC WOOD in

10¢ and 25¢ tubes, 35¢ cans.



**PLASTIC WOOD**

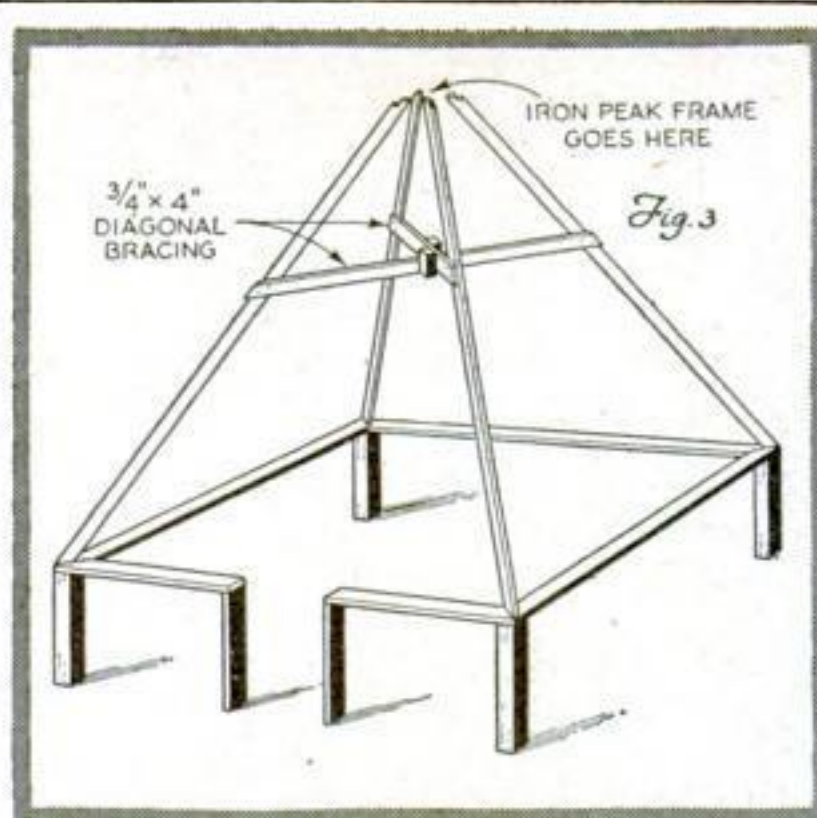
HERE'S THE  
MASTER  
FIXER



Quickly, permanently joins and repairs china, glass, wood, celluloid, etc. It's Transparent—yet sets like granite.

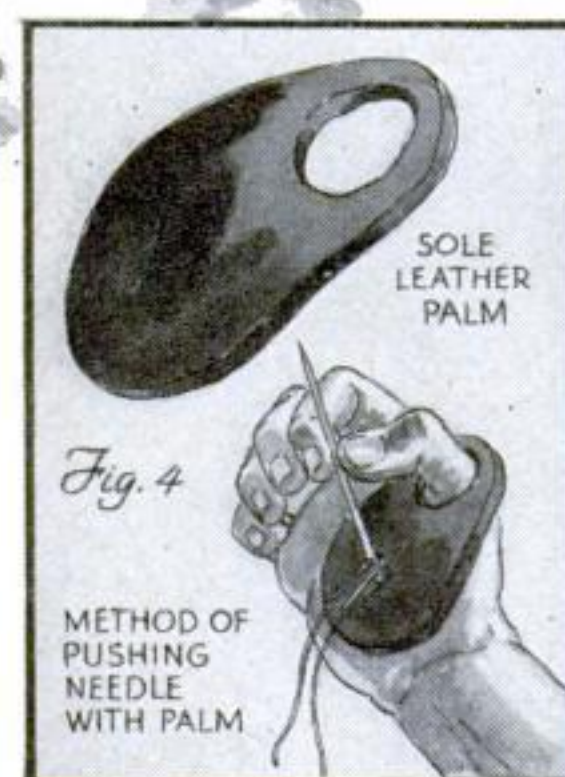
Also available in Metal color. At paint, hardware, 10¢ stores.

**Old English  
CEMENT**



Smoke flaps in use and, above, the best frame

## Heating a Square Tent ON CHILLY DAYS



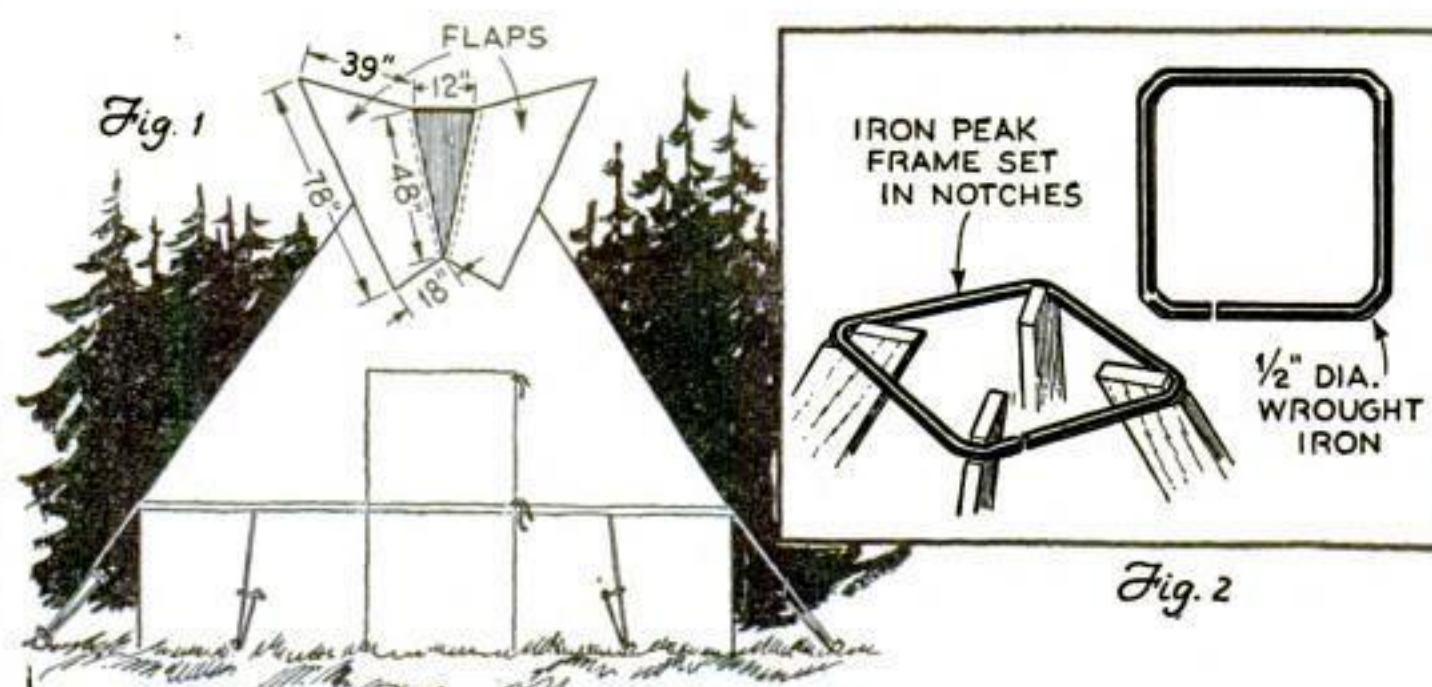
**I**F FITTED with smoke flaps like a teepee, an ordinary square Sibley tent can easily be heated for early spring and late fall camping, and the cooking can be done in comfort under cover. Besides, your firewood is always dry, less wood is required, and light as well as heat is provided by the fire.

A triangle is cut out of the front of the tent as shown in Fig. 1, and the flaps are sewn on. Cut, hem, and fit small pole pockets into the upper corners of the flaps before hemming the flaps themselves; then turn the hems of the flaps over the edges of the pockets, and sew all together securely when hemming the flaps. A palm protector made as in Fig. 4 will aid in sewing the heavy cloth.

While it is possible to use a center pole with this arrangement if the foot of the pole is covered with asbestos and the fire is placed a trifle forward of the center of the tent, it is more satisfactory to make a frame. The best arrangement is shown in Fig. 3, made with fir "two by fours" and  $\frac{3}{4}$  by 4-in. boards for the diagonal bracing. If the corner and door posts are sunk firmly in the ground, the diagonal bracing may be omitted. Should lumber be difficult to get, four corner pieces alone will serve, if the X-shaped cross bars are placed about 6½ ft. from the ground. In either case, the poles are notched at the top (Fig. 2) to receive the iron rod sewed into the top of the tent.

The knack of handling the fire must be learned by experience. The force of the draft is controlled by raising the windward sod cloth. The tent door must be kept closed.

In a teepee, the beds are usually placed at the back. Cooking utensils and provisions are arranged on one side; firewood and equipment on the other. Hangers are strung to the poles for clothing.—J. H.



Size of flaps and how poles are notched to fit rod in top of tent



## This Racing Yacht Won a Championship

(Continued from page 75)

the keel. Do the same with opposite side, the latter plank being lapped over the first plank at keel and trimmed so that edge will be at center of keel. Trim overlap with a razor blade and fill with seam composition. Apply one coat of shellac or paint to inside of hull. Attach deck, applying seam compound, then sandpaper and shellac. Finish hull with stain and three coats of varnish.

To make lead keel, first cut a wood pattern to shape. Saw a slot  $\frac{1}{2}$  in. deep in upper end and fit 20-gauge galvanized iron  $\frac{3}{4}$  by 9 in. into slot. Varnish pattern. When dry, apply thin oil, and set on oiled glass in upright position as shown. Surround with a wooden frame and pour thick mixture of plaster and water in one side. When plaster has set, trim off portion that has flowed to other side; then oil the surface of the plaster and pour the second half. Separate the halves and remove wood pattern and metal. Dry over a stove for three hours, set in a box of sand, put the metal slot former in position, and cautiously pour melted lead into mold. It is dangerous to pour hot lead into a damp mold because of the possibility of an explosion. When cool, remove lead from mold, take out the metal strip, and smooth the casting.

(Continued on page 105)

### LIST OF MATERIALS

#### WHITE PINE

No. Pc.	T.	W.	L.	For
1	$\frac{3}{4}$	8	31	Work board
1	$\frac{3}{4}$	4	28	Keel, stem, and stern
1	$\frac{1}{4}$	6	32	Topside planks and deck beams
2	$\frac{1}{4}$	4	7	Wedge and mold blocks
1	1	$1\frac{1}{2}$	6	Pattern for lead keel

#### WATERPROOF BIRCH PLYWOOD

1	$\frac{3}{32}$	8	30	Deck
2	$\frac{3}{32}$	$4\frac{1}{2}$	31	Bottom planks

#### DOWEL

1	$\frac{1}{2}$	30	Mainmast
1	$\frac{3}{8}$	60	Upper mast and spars

NOTE: All dimensions given in inches.

#### MISCELLANEOUS

20-gauge galvanized sheet iron, 8 by 10 in. for fin and rudder.  
 $1\frac{1}{4}$  lb. lead for keel.  
 $\frac{1}{8}$ -in. German-silver or brass wire, 18 in. long, for rudder control.  
 $\frac{1}{4}$ -in. copper tubing, 3 in. long, for rudder-stock tube.  
 Flathead brass screws: 1 doz.  $\frac{3}{4}$ -in. No. 3, 1 doz.  $\frac{5}{8}$ -in. No. 4, 1 doz.  $\frac{3}{4}$ -in. No. 5.  
 Roundhead brass screws: three 1-in. No. 8.  
 2 flat, brass  $\frac{3}{4}$ -in. cleats.  
 3 rigging toggles.  
 4 rigging hooks.  
 1 doz. brass screw eyes,  $\frac{1}{8}$ -in. eye.  
 $1\frac{1}{2}$  doz. brass rings for sails,  $\frac{1}{4}$  in.  
 2 brass rings for topmast,  $\frac{1}{2}$  in.  
 Brass sleeve for topmast,  $2\frac{1}{4}$  in. long,  $\frac{3}{8}$  in. inside dia.  
 1 yd. balloon cloth,  $36$  in. wide.  
 Seam compound.  
 Mahogany stain and varnish for hull.  
 Shellac or paint for inside of hull.  
 Round toothpicks.  
 Casein glue.  
 10 ft. fishline.  
 10 ft. mason line.  
 1 spool soft solder for rudder.  
 2 lb. plaster for keel mold.  
 Nile green enamel paint for fin and rudder.

# Smooth and Friendly Throughout the Years

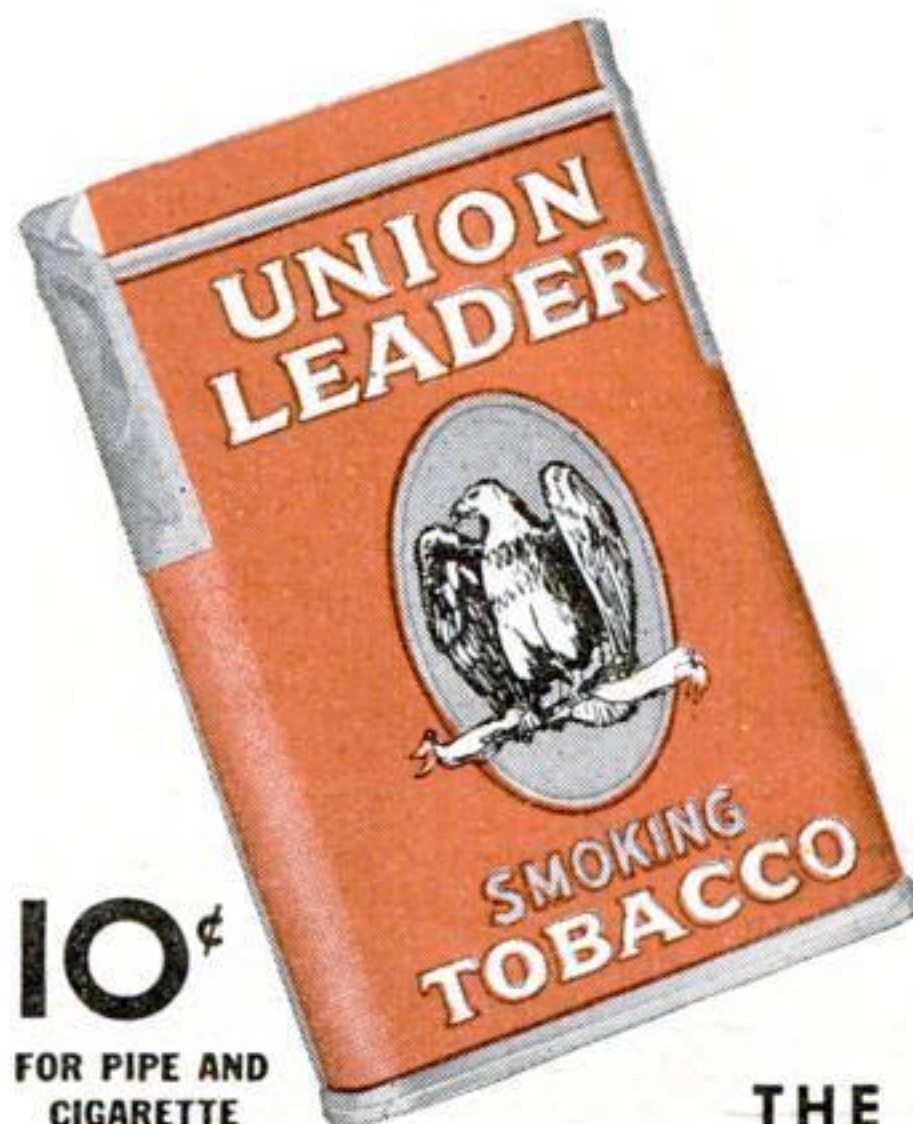
**IN 1900.** . . "I am sending you this picture of myself because it was taken at the turn of the century, when I first took up with pipe smoking. I recollect spending the next five or six years trying different smoking tobaccos—but then I happened on UNION LEADER which suited my taste just right."



**TODAY.** . . "Although I am now 62, I am still smoking UNION LEADER, my favorite of by-gone days. After all these years, I find this kindly Kentucky Burley as smooth-tasting and pleasurable as ever. So I set myself to writing this, just to tell you what a fine tobacco you make."—William C. Sabin, Penn Yan, N. Y.



# Union Leader



**10¢**  
FOR PIPE AND  
CIGARETTE

**ALWAYS** . . . For more than  
a third of a century

UNION LEADER has been receiving  
"fan mail" from pipe lovers  
who have found pleasing  
contentment in this age-mellowed,  
bite-free smoking blend.

For filling a pipe or rolling your own,  
UNION LEADER has always been  
a very big value for a dime.

Copyright, 1938, by P. Lorillard Co., Inc.

**THE GREAT AMERICAN SMOKE**



**PUSH-ability ALONE  
IS NOT ENOUGH  
IT'S  
DEPENDability  
THAT COUNTS!**



Any outboard motor will push a boat. (Johnson's, of course, have N. O. A. certified horse power push-ability.) But it takes more than that to make a good fishing motor!

DEPENDable slow trolling speed, 360° steering with reverse, patented Co-Pilot, shock absorber drive—these are features that make a fishing motor. You get them in a Johnson!

See Johnson's sensational new bantam-weight beauties. Low priced! Quality built! Phone your dealer for a demonstration.

**JOHNSON MOTORS**  
500 Pershing Rd., Waukegan, Ill.  
Johnson Motors of Canada,  
Peterboro, Canada

**ONLY JOHNSON  
HAS ALL THREE!**

**1 ALTERNATE FIR-  
ING.** Two power  
impulses per revolu-  
tion instead of one. Smooth!

**2 UNDERWATER EX-  
HAUST.** No exhaust  
noise; no exhaust fumes.

**3 FULL PIVOT REVERSE.**  
Complete maneuverability.  
360° steering and reverse!

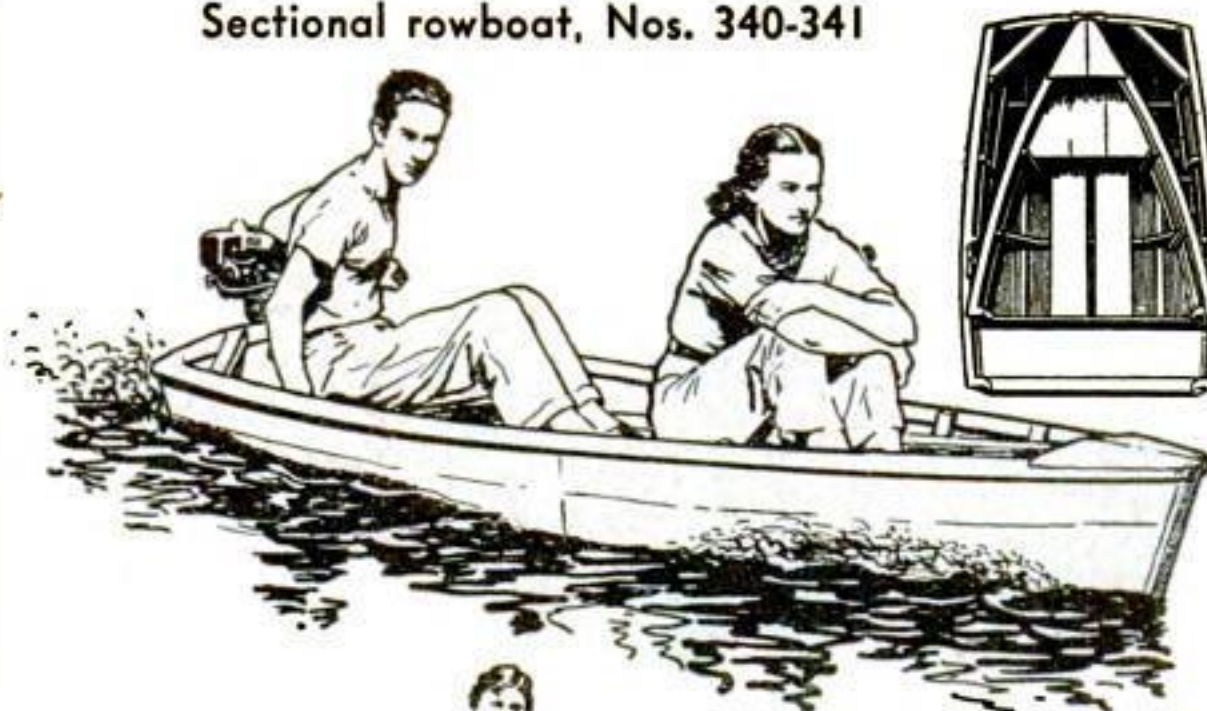


**FREE!**

WRITE for new  
Sea-Horse Handy  
Chart describing  
Johnson's 9 great  
motors for 1938.  
Packed with new  
developments!

**JOHNSON**  
*Sea-horse*  
**OUTBOARD MOTORS**

Sectional rowboat, Nos. 340-341



All-purpose boat,  
No. 331-R



Midget boat or pram,  
No. 339-R



## New Boat Plans Added to Blueprint List

**B**UILDING a boat is an ideal project for spring because it is something you can enjoy all summer long and have available for many seasons to come. Pictured above are our three newest boats, plans for which are listed below. We have blueprints for many types of boats and a wide variety of other projects, so if you do not see what you want, send a stamped, self-addressed envelope for our complete list.



### BOATS

All-Purpose Boat, 11 ft. 5 in. long, for sails, outboard motor, or rowing, 331-R.....	.75
Canoe, 16-ft. canvas-covered kayak, with sail, 192-193-194-R.....	1.00
Combination Boat, 15-ft. hull, can be powered by sail, outboard motor, or oars, 131-132-133-R.....	1.00
Folding Duck Boat, 13 ft. long, 170-R.....	.50
High-Speed Boat for Small Outboard Motors (7 ft. 11 in. long), 257-R.....	.50
Midget Boat or Pram, 9 ft. long, for oars, sail, or outboard motor, 339-R.....	.50
Racing Runabout (13 ft. long, for outboard motor), 261-262-R.....	.75
Racing Sailboat Blackcat (13 ft. 4 in. long, 5 ft. beam, weighs 250 lb., Marconi rigged), 321-322-323-R.....	1.00
Sectional Rowboat, 9 ft. 8 in. long, can be used with small outboard motor; all wood construction, 340-341.....	.50
Sport Runabout (9 ft. 8 in. long, 43-in. beam, for small outboard motors), 309-310-R.....	.75
Utility Rowboat, 13-ft., (can also be sailed or driven by outboard motor), 224-R.....	.50



### MODELS

Aircraft Carrier Saratoga (18 in.) and a Flush-Deck Destroyer (6¼ in.), 226-227-R.....	.75
Alabama, famous Confederate bark-rigged steam sloop, 21½-in. hull, 335-336-337	1.00
Baltimore Clipper (8 in. long, carved sails), 92.....	.25
Bluenose, the famous fishing schooner, 17½-in. hull, 110-111-112-R.....	1.00
Brig Malek Adhel (20-in. hull; frame-and-plank construction), 304-305-306-R.....	1.25
Clipper Ship Sea Witch (9½-in. hull), 219.....	.25
Cruiser U.S.S. Indianapolis (12-in.), 216.....	.25
Freighter, Ocean (14-in.), 271.....	.25
H. M. S. Bounty (8½-in. hull), 254.....	.25
Liner President Lincoln (14¾ in.), 325.....	.25
Locomotive Model, Hudson Type, HO Gauge (14 in. long; driven by 6-volt motor), 329-330-R.....	.75
Mayflower (24 in.), 83-84-85-R.....	1.00
New Bedford Whaleboat (14-in.), 326-R.....	.50
Privateer Swallow, Baltimore clipper, (13-in. hull), 228-229-230-R.....	1.00
Racing Yacht Seascout (42-in.), 106-107-R.....	.75
Roman Galley (19-in.), 138-139-R.....	.75
Sovereign of the Seas, clipper ship (20½-in. hull), 51-52-53-R.....	1.00

Spanish Treasure Galleon (24 in.), 46-47....	.50
Trading Schooner (17½-in. hull), 252-253....	.50
U. S. Battleship Texas (3-ft. hull), 197-198-199-200.....	1.00
{Construction kits are available for some of these models. See page 22.}	



### FURNITURE

Bed and Armchair Table, 333A.....	.25
Cedar Chest, 17.....	.25
Double-Decker Bed, 277A.....	.25
End Table, American Empire, 241A.....	.25
Fireside Bench, Colonial, 187A-188A.....	.50
Four-Leaf Card Table, 239A.....	.25
Gate-Leg Table with Round Top, 24.....	.25
Hanging Wall Cabinet, 280A.....	.25
Modernistic Lamps (three designs), 93.....	.25
Reading Tables, Two, 68.....	.25
Sewing Table, 1.....	.25
Silverware Chest on Stand, 256A.....	.25
Smoking Stand, Modern, 238A.....	.25
Tea Wagon (turning), 13.....	.25
Telephone Table and Stool, 18.....	.25
Tilt-Top Table (turning), 140.....	.25



### RADIO SETS

All-Wave Portable Receiver (two tubes, operated by battery), 217-R.....	.50
Amateur Short Wave Receiver, 155.....	.25
Amateur Radio Transmitter, 183-184.....	.50
Five-Tube Short Wave (A.C. or D.C.), 223.....	.25
Full Electric Headphone Set, 130.....	.25
One Tube (battery operated), 103.....	.25
Screen-Grid Set, 109.....	.25
Short-Wave Converter Unit, 137.....	.25



### MISCELLANEOUS and TOYS

Arbor with Two Seats and Garden Gate, 9.....	.25
Baby's Crib and Play Pen, 26.....	.25
Garden Trellises, 34.....	.25
Log-Cabin Bird House, 244A.....	.25
Projector for Photos and Pictures, 259A.....	.25
Rustic Settee, 156A.....	.25
Toy Electric Motor, Softwood Coffee Table, and Scottie Pins, 332A.....	.25
Turned Costume Jewelry, 275A.....	.25

**Popular Science Monthly**  
353 Fourth Avenue, New York

Send me the blueprint, or blueprints, numbered as follows:

I am inclosing.....dollars.....cents

Name.....

Street.....

City and State.....  
Please print your name and address clearly.



## Reconditioning a Dull Pencil Sharpener

STANDARD type rotary pencil-sharpener cutters become dull all too quickly under heavy usage and are usually discarded. The cutters can, however, be sharpened in five minutes by the following simple method, and the new edge lasts a considerable time.

Remove the sharpener handle and take out the cutting-mechanism cluster. Hold the handle end in the right hand, and the other end in the left hand at an angle of about 35 deg. higher than the right hand. Now bring the cutting rolls, one at a time, lightly up against a fine, high-speed grinding wheel, moving from one end of the cutter to the other. With proper light, the bright edges can be seen to disappear, and the job is done. Wash the cluster in gasoline and reassemble.—JOHN H. BECKER.

## Fitting Hammer Handle to Remain Tight

WOOD handles for hammers, sledges, or similar tools can be fitted so they will not loosen by the following simple method: Trim the end until it is from  $\frac{1}{8}$  to  $\frac{1}{4}$  in. oversize for the eye of the tool. Bevel the end and dip it into any heavy-bodied oil or cup grease as far up as the head will come. Then hold the greased end in the fire until the oil becomes foaming hot and the handle is almost at the burning point. Quickly drive the handle into the head and wedge as usual.—STANLEY RUSSELL.

## This Racing Yacht Won a Championship

*(Continued from page 103)*

Cut fin and rudder from 20-gauge sheet iron. Drill and countersink ten holes for screws that fasten fin to hull, and bend flaps as shown. Be careful to countersink holes correctly. Rivet lead keel to fin with brass screws. Paint fin and rudder with Nile green enamel.

Solder  $\frac{1}{8}$ -in. German-silver wire (brass wire may be substituted) to rudder and, after fastening fin to center of hull, draw wire through tube, and bend to form steering lever. Attach lower end of rudder to fin with a wire ring. The automatic steering device is shown in one of the drawings.

Use 36-in. wide balloon cloth for the sails, cutting so that the weave is at right angles to outer edge of sails and allowing for a  $\frac{1}{4}$ -in. seam. Cut mainmast from  $\frac{1}{2}$ -in. dowel, and upper mast and spars from  $\frac{3}{8}$ -in. dowel. A small metal sleeve holds the two masts together. Arrange sails and rigging as indicated; and the yacht is ready to match its prowess against any other sailing model.

For straight sailing the string from the boom is passed through the screw eye and tied to the cleat, but for sailing before the wind, the string is first passed through a small ring soldered to the tiller as shown.

*Enjoy sight-saving light in more places*



**LOWEST  
PRICES**

*in history  
on Brighter*

**G-E  
MAZDA LAMPS**



← Buy the new and brighter G-E bulbs where you see this emblem

## Are you enjoying these benefits?

- ☐ Easier seeing at your **HOME WORK-BENCH** with a new 150-watt G-E bulb.
- ☐ A **BEDROOM** that has good general light... from a 100-watt bulb.
- ☐ A **STUDY TABLE** that helps guard young eyes... with a new 100-watt bulb in a table model I. E. S. lamp.
- ☐ A **LAUNDRY** where washing and ironing are easier... with a 150-watt bulb.
- ☐ AN **EASY CHAIR** that is really easy... with a new **THREE-LITE** bulb in your three-light I. E. S. lamp.
- ☐ A **BATHROOM MIRROR** that makes shaving easier... thanks to the soft, glareless light from a **Lumiline** bulb on each side of the mirror.
- ☐ A brighter, cheerier **KITCHEN** with a new 150-watt G-E **MAZDA** lamp.
- ☐ **BETTER LIGHT** for better, safer seeing throughout your home.

*Begin today, with a fresh supply of the new and brighter G-E MAZDA Lamps... at lowest prices in history*

**GENERAL  ELECTRIC  
MAZDA LAMPS**



# YOU'RE TO BLAME

... IF YOUR PICTURES ARE NOT CORRECTLY EXPOSED!



It's not your camera, or the weather that's at fault. You're "guessing" at camera settings, when there's no need to guess at all. You can be sure your settings are correct... sure each exposure is perfect no matter what the weather or what type of camera you own... if you use a WESTON Exposure Meter. This compact, easy-to-use meter gives correct camera settings indoors or out, for any type of still or movie camera, and any film including color. Insures perfect exposures every shot. See the WESTON at dealers, or write for literature... Weston Electrical Instrument Corporation, 622 Frelinghuysen Avenue, Newark, N. J.



**WESTON**  
Exposure  
Meter

## \$190<sup>00</sup> in 8 DAYS STUCCO SPRAYING



Philip J. Hershberger writes: "Thought you would like to know how I am getting along. Well, my first home was colored with Colorcrete and this job brought me three more homes to Colorcrete which I did in eight days, setting me a profit of \$190.00 and now I have three homes and a business named in Colorcrete." It fuses with any masonry surface. It fills all cracks and can be sprayed in any thickness and in 30 colors. Fully proven by over twelve years actual use under all conditions and every climate.

**OFFERS BIG EARNINGS.** Operators report costs of 2c and up per sq. ft. and sell up to 7c. Some have paid for their equipment from first few jobs. Machine capacity up to 1,000 sq. ft. per hour.

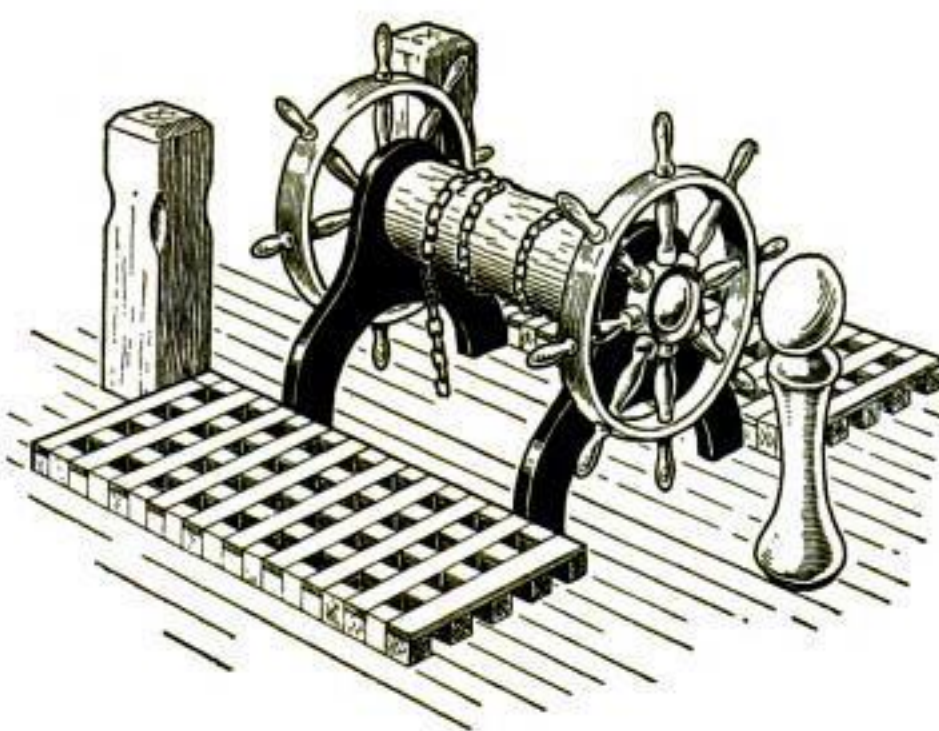
**GET THE FACTS.** Send for COLORCRETE Book "Proven Business Opportunity." Write today.

**COLORCRETE INDUSTRIES, INC.**  
572 Ottawa Ave. Holland, Mich.



# Guns for the 'Alabama' Model

(Continued from page 83)



on wooden stanchions of their own.

At this point I fitted the boat davits, but laid them aside until the rigging had been finished. The davits are 1½ in. high. Their lower ends are set in sockets nailed outside the hull, just above the molding; and they are retained above by cleats or brackets nailed to the main rail, which has to be cut away a bit to enable the davit to stand upright. The davits at the stern are a trifle shorter and have not much curve.

The *Alabama* had twelve gun ports, but carried only six guns in broadside. I set these in the first, third, and last ports, leaving the center ones for the pivot guns.



SKYLIGHT

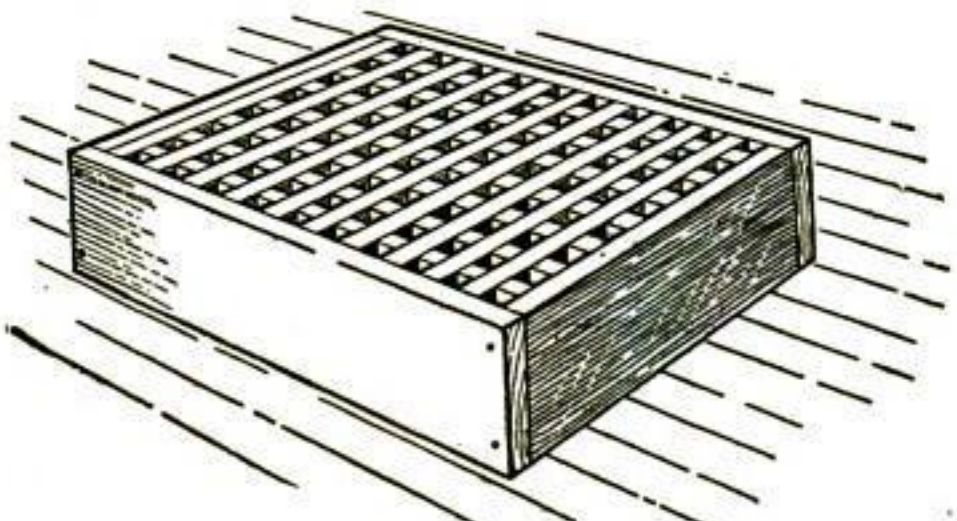
The top and side views of skylight

The broadside guns were thirty-two pounders, smooth bore. They are shown in detail. The guns themselves may be purchased or turned from brass, or turned or whittled from wood. The carriages can be built up as was done in the case of the

Hartford model, but solid ones are much easier to make.

Cut a stick ¼ by 5/16 in. in cross section, and cut the end square across. Then cut it down in steps as indicated. Hollow it lengthwise to take the gun, cut the outside to the same slope, cut notches to take one half the trunnions, and fasten the gun with bent-pin staples. For the trucks (wheels) cut a 1/16-in. round stick the right length, make a notch in it halfway down, just wide enough to take the carriage, and glue it on the bottom.

To fasten down each gun, I drove a pin point through the back of the carriage into the deck.

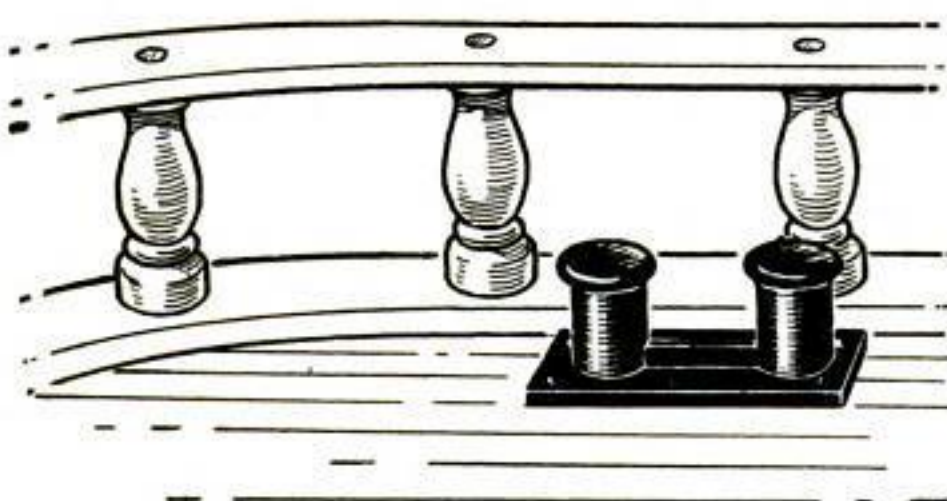


One of the hatches with its grating. The steering wheels are shown at top of column

The breeching is a thick cord with its center seized to the cascabel (round knob). The ends are seized to eyebolts in the bulwarks. The cord should be quite slack.

Gun tackles on each side require two 1/16-in. blocks, one fastened to an eyebolt in the side of the carriage and the other to an eyebolt in the bulwark. The end of tackle is secured by hitching it around all parts.

In addition to these, the *Alabama* had one 7-in. Blakely rifled gun and one 8-in. smoothbore pivot gun. The former was carried amidships, abaft the foremast, and the other abaft the mainmast. I simplified the pivot carriages for these by making carriages



A portion of the poop-deck railing, which is supported on turned wooden stanchions

as previously described. Each was set on a piece of 1/16-in. plywood painted to represent the sidepieces and athwart battens. Small trucks were placed beneath, as illustrated. The plywood was secured to the deck with pins.

Tackles with two blocks each were taken from the back of the slides to eyebolts in the deck, and others from each side of the gun carriages to similar eyebolts.

The guns and carriages are all black.  
(TO BE CONTINUED)

## Trees In Miniature

MINIATURE trees can easily be made from ordinary rubber sponges. Cut them to the desired size and shape; then, using tweezers, tear out little pieces to give depth between the branches. Stick the sponges on sticks with silicate of soda (water glass).

Now fill a tin can with water to within ½ in. of the top, the can being deep enough to enable the tree to be completely immersed. On top of the water float several colors of lacquer in suitable shades such as greens, blues, and yellows. Dip the miniature tree down through the floating colors, and hang it up to dry.—C. A. VOELCKEL.

## Making Screen Doors Fit

SCREEN doors that do not fit tightly at the top or must close against an uneven frame may be improved by nailing a strip of old inner tube, folded double, along the top of the door. The slight bias pull (from cutting a straight strip from the curved tube) makes it fit well, and it adjusts itself to uneven surfaces.—H. PAPASHVILY.





The plywood roadbed is supported by brackets on the inside and stiff wires on the outside, bent as shown and spaced a foot or two apart. Strong cardboard is used for the wall, and thin white cardboard for the ceiling.

## How to Straighten Old Tin-Plate Track

DETAIL OF DRAWPLATE

DRILL

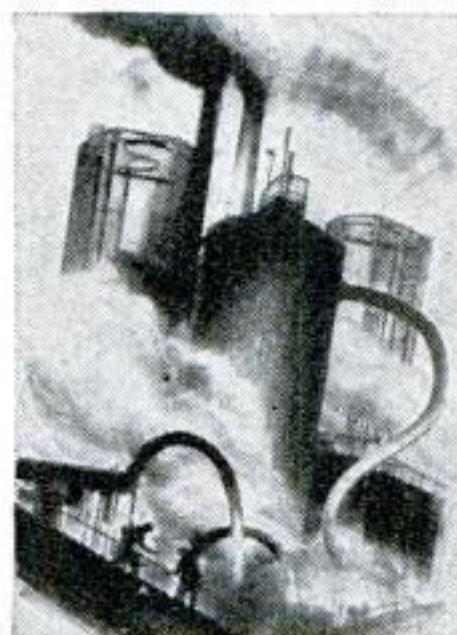
WOODEN TIES

3/16" x 1/2" METAL STRIPS BENT OVER RAILS

SMALL BRAD

To fasten track of this kind to wooden ties, cut a number of pieces of thin metal  $\frac{1}{2}$  by  $\frac{3}{16}$  in., punch a hole in the center, and nail them to the ties with one cigar-box nail each. Bend the ends as shown.—EDWIN L. EDLER.

**"You takes a lil' tech o' dis,  
an' a lil' dab o' dat..."**



To assure your car of perfect lubrication, Quaker State goes about its daily transformation of the finest Pennsylvania crude oil into a useful product *differently* from the old mammy. Instead of a rule of thumb "tech of dis and a dab of dat" method, the most exacting control modern science can pro-

Quaker State's four great, modern refineries employ a group of scientists who have spent a working lifetime in solving the problems of refining the world's best motor oil. Every drop of Quaker State is rich, pure lubricant. *Acid-Free Quaker State* will make your car run better, last longer! Retail price, 35¢ a quart. Quaker State Oil Refining Corporation, Oil City, Penna.

# Buy Acid-Free Quaker State

**IT MAKES CARS RUN BETTER  
LAST LONGER**







No. 415-YA, 9 1/4" swing by 3' bed Workshop Bench Lathe with Horizontal Motor Driven Adjustable Countershaft, 1/2 h.p. Reversing Motor, Switch and Belts. (\$15 Down—\$6 Monthly for 18 Months) **\$117.00**

## INVALUABLE TO INDUSTRIES EVERYWHERE FOR HANDLING PRECISION OPERATIONS...

### SOUTH BEND BACK-GEARED SCREW-CUTTING PRECISION LATHE

This 9-inch South Bend Lathe used by:  
**MANUFACTURERS  
TOOL ROOMS  
LABORATORIES  
MACHINE SHOPS**

—Automotive  
—Electrical  
—Gun Smiths

**U.S. GOVERNMENT  
SCHOOLS  
HOME WORK  
SHOPS  
INVENTORS**

The 9"x3" South Bend Precision Lathe does these operations:

**—TURNS—BORES  
—CUTS SCREW  
THREADS—FACES  
—DOES MILLING,  
CHUCKING, REAM-  
ING, DRILLING,  
FILING AND HUN-  
DREDS OF OPERA-  
TIONS IN STEEL,  
IRON AND OTHER  
METALS.**

There are 5 sizes of South Bend Lathes—9", 11", 13", 15" and 16" swing with bed lengths 3' to 12'. In motor or counter-shaft drives. Priced \$85 to \$1500.

**W**ELL-KNOWN industries everywhere are using the 9-inch Workshop South Bend Lathe—and finding it the most profitable investment they can make. Designed and constructed for precision accuracy, this 9-inch Lathe handles machining operations to the most exacting specifications. Workmanship and new features insure speed, accuracy, and versatility. Industry finds it cannot afford to overlook this remarkable tool.

Features include—Twin Gear Reverse to Lead Screw, Ball Thrust Bearing on Spindle, Automatic Longitudinal Screw Feed to Carriage, Precision Lead Screw for cutting screw threads from 4 to 112 per inch, 3/4-inch hole through spindle

taking collets up to 1/2-inch, V-ways on lathe bed, Precision Cut steel gears.

38 attachments are available for milling, grinding, draw-in collet chuck work, taper work, and many other operations. Made in 3', 3 1/2', 4', and 4 1/2' bed lengths, and in 8 different drives. Costs less than 2 cents per hour operating from ordinary lamp socket.

### SOUTH BEND LATHE WORKS

822 E. Madison St., South Bend, Indiana

#### LATHES ARE STOCKED IN PRINCIPAL CITIES

Chicago—C.B. Burns Mchry., 541 W. Wash Blvd.  
New York—A. C. Colby Mchry., 183 Centre St.  
Philadelphia—W. B. Rapp Mchry., 132 No. 3rd.  
Los Angeles—Eccles & Davies Mch., 1910 Santa Fe.  
Detroit—Lee Mchry. Co., 6318 E. Jefferson Ave.  
Milwaukee—Voell Mchry. Co., 1533 No. 16th St.  
Boston—MacKenzie Mchry. Co., 36 Oliver St.  
Cleveland—Reynolds Mchry., 2034 E. 22nd St.

## WRITE FOR THESE BOOKS

- ☐ No. 33LB, "How to Run a Lathe," 25c.
- ☐ No. 36A, "How to Cut Screw Threads," 10c.
- ☐ No. 35, "How to Grind Cutter Bits," 10c.
- ☐ No. 46, "9-inch Workshop Catalog," Free.

**SOUTH BEND LATHE WORKS,**  
822 E. Madison St. South Bend, Ind., U.S.A.  
Please send the books checked here.

Class of Work.....  
Name.....  
Address.....  
City.....State.....



## SOUTH BEND Precision LATHES

### Build a MEGOW BOAT OR AIRPLANE MODEL

Most extensive line for the constructive hobbyrafter... gas-powered airplanes, big flying and detail scale models, down to small solid models any boy can build. The 52-page Megow catalog also illustrates many fascinating SHIP and BOAT MODELS, from 10c to \$6.00. Also O-Gauge Freight Cars, Model Speed Boats, ready-made parts and supplies. The MAYFLOWER (shown here) length 17 1/2 in., printed deckpiece construction, \$2.50; with carved hull, \$3.00. By mail, 15c extra.



**QUAKER FLASH**  
\$4.95 plus 30c postage  
Uses any model airplane engine you prefer. Easily carried in car. Adjustable rudder, semi-adj. stabilizer, motor easily removed. 3 1/4 in. rubber wheels. Wingspan, 67 in.

Megow's gas-powered Scale Models—wing-span up to 84 inches. Include such favorites as TAYLOR CUB, STINSON RELIANT, ARMY PURSUIT, etc. Prices \$6.50 to \$14.50. Also a wonderful new line of flying and detail scale models—ARROW SPORT V-8, AERONCA K, MONOCOUE 90 and others—50c plus 10c postage.

Send 5c postage for your copy of the Megow Catalog now.

**MEGOW'S, Dept. PS**  
Howard & Oxford Sts., Philadelphia, Pa.  
or 217 N. Desplaines St., Chicago, Ill.

## FREE SENSATIONAL OFFER

**2 FENCING SWORDS FREE**

**FENCING**  
WORLD'S FINEST SPORT  
EXCITING FUN-HARMLESS

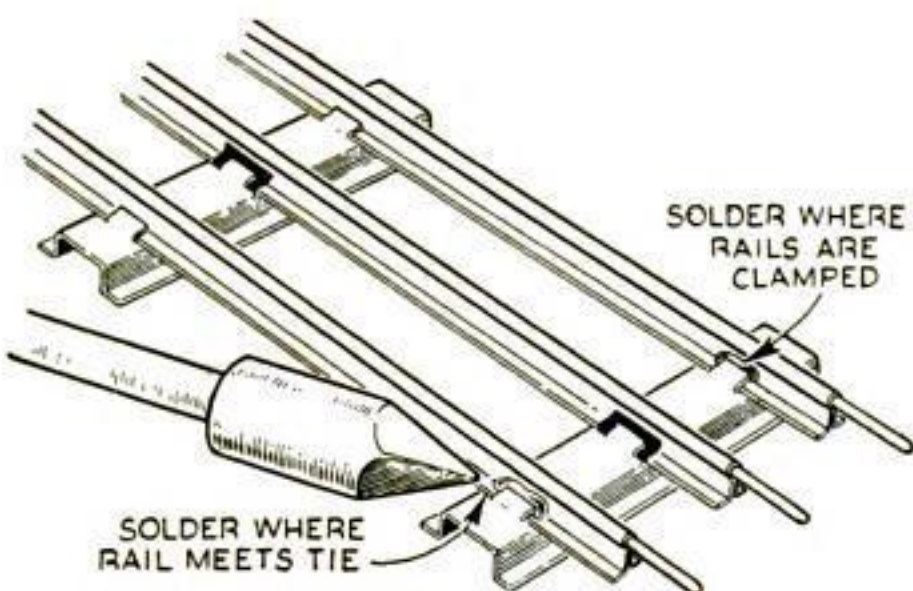


Develops strong body and alert mind. **HARMLESS.** The spring-steel 3-foot-long foils (swords) are equipped with rubber buttons. Aluminum cup-shaped hand guards. Our De Luxe foils are built for hard usage.

Complete set of two foils (swords) and free instruction booklet, only \$1.75 postpaid. Two additional fencing swords **FREE** for limited time. (Regular price of these two sets of foils \$3.96.) **ORDER NOW.**

**ALL-AMERICAN FENCERS GUILD**  
Dept. 5 S.P. 48 West 48th St., New York, N. Y.

## Solder Prevents Train Track From Spreading



Two ways to make the track more rigid

**TIN-PLATE** model railway track can be improved by soldering the underside of each rail near the ends. The rails then will not spread apart, but will provide a tight fit for the connecting pins. Drops of solder placed where the rails are clamped to the ties also will help the rigidity.—SAMUEL COSMAN.



The locomotive and tender ready to run

## Building a Model Locomotive

**IS EASY...INEXPENSIVE AND LOTS OF FUN**

**I**F YOU thrill to the roar of the modern locomotive as it speeds along its steel highway and wish you could build a miniature of it, now is the time to take up model railroading. Our HO-gauge, Hudson-type model locomotive is simplified, practical for the small home, and costs little to construct.

Kit 1L (\$9.95\*) contains all the materials you need for building a 14-in. locomotive and tender including sheet brass, brass tubes, rods, wire, springs, fiber, screws, boiler head, cylinder block, ladder strip, six driving wheels, and ten pairs of wheels for trucks. Kit 2L (\$4.50) consists of a specially built 6-volt motor and worm and gear for the locomotive. All the raw materials and a track gauge for making 25 ft. of HO track are contained in Kit 3L (\$4.00\*). Kit 4L (\$6.95\*) is the same as Kit 3L except that it contains third-rail chairs, which eliminate much of the soldering.

Start this fascinating hobby now. Use the coupon below.

**NOTE:** If you live west of the Mississippi River or in Canada, add 50 cents to all prices marked with an asterisk (\*). By sending your remittance with this order, you save the C.O.D. charge. Canadian orders cannot be sent C.O.D. Remit by money order, check, or registered mail. This offer is made only in the United States and Canada.

**Popular Science Monthly, Dept. 58B**  
353 Fourth Avenue, New York, N. Y.

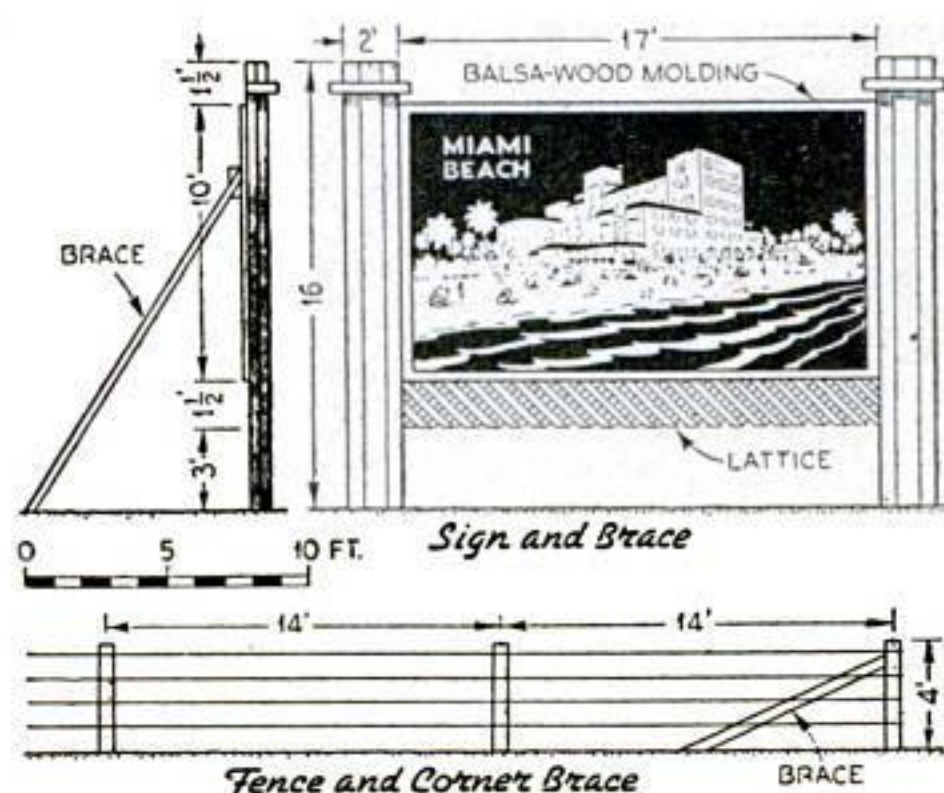
☐ Kit 1L ☐ Kit 3L ☐ Send C.O.D.  
☐ Kit 2L ☐ Kit 4L ☐ Money inclosed

Name.....

Address.....  
(Print name very clearly)



## Miniature Signboards for Model Railway



**C**OLORED magazine advertisements, when cut out and pasted on cardboard, make good miniature signs for a model railway. To keep the signs from curling, paste a second piece of paper on the back.

Balsa strips were used for the framing and for the supports at the back of the signboard illustrated. The drawing is purposely dimensioned like a full-size signboard so that a model may be made to any scale desired. The lattice at the bottom may be omitted or imitated by using cross-stitch canvas, a coarse, stiff cloth intended for art needlework, with every third thread pulled out. The lattice is painted to match the rest of the framing.

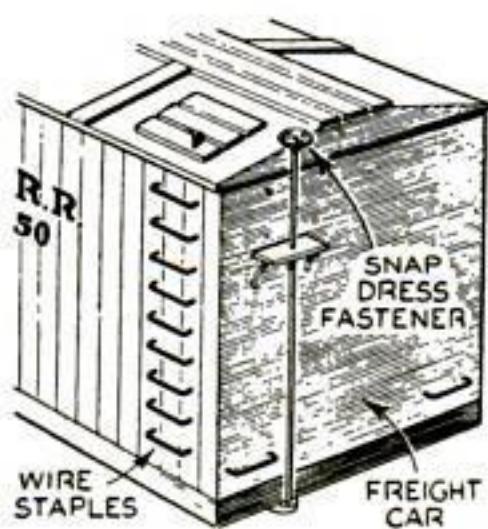
Grass for a surrounding pasture is made by painting the base with light green paint, mottled here and there with pale yellow. Before the paint is dry, sprinkle a thin layer of fine sawdust, previously dyed a grass green, over the "ground."

Nearby trees are small pieces of dyed sponge glued to small twigs. The sawdust and sponges are easily dyed if placed in a cloth bag and dipped in dye.

If your road is built to a scale of  $\frac{1}{4}$  in. to the foot, ordinary kitchen matches will do for pasture fence posts. Place them in holes drilled in the base and then clip them off so that they will be about 1 in. high. The barbed wire is fine black thread glued to the posts. The corner posts are braced as shown in the sketch.—J. W. CLEMENT.

## Freight-Car Details

**M**ODEL railroaders who build their own box cars will find that black snap dress fasteners make surprisingly realistic brake wheels. Wire staples of the type used in offices for fastening papers together can be used as rungs for the type of ladder in which the rungs are fastened separately to the side of the car. The staples come in several widths so it is possible to find a size for both "O" and standard gauges.—W. J. BAKER.



## HAVE YOUR SPARK PLUGS CLEANED Now!

Dirty or worn spark plugs impair engine performance three ways: they cause a fuel waste as high as 1 gallon in 10, they reduce power output, and they cause hard starting. The reason is simple. When dirty, spark plugs misfire intermittently. The remedy is widely available. It is the service rendered by 70,000 Registered AC Spark Plug Cleaning Stations. These stations are equipped with the AC Cleaning Machine which, with a specially crushed, semi-soft rock under controlled air pressure, removes spark plug oxide coating, soot, and carbon thoroughly and quickly. The cost of this service is only 5c a plug. The average plug needs it every 4,000 miles.



Look for this  
SIGN  
when you need  
plugs or plug  
service



To remedy  
spark plug wear  
REPLACE  
WORN PLUGS  
with  
**AC**  
QUALITY  
SPARK PLUGS

AC SPARK PLUG DIVISION • General Motors Corporation • FLINT, MICHIGAN



# AMERICA'S No. 1 MOVIE CAMERA



Richard Arlen, star of Columbia's "No Time To Marry."

With F:3.5 Lens... \$19.95

Over 200,000 enthusiastic UniveX owners will tell you why this amazing movie camera, in one short year, out-sold those of all other makes combined! Compact, lightweight, easy to load and operate, and always dependable—it's the only movie camera in the world that uses the inexpensive 60¢ UniveX Cine Film and takes theatre-quality movies at less cost than snapshots!

## UNIVEX MINICAM



The lowest-priced precision-built candid camera ever offered! Uses UniveX 10¢ and 15¢ roll-film. The only one taking six exposures, thus eliminating unnecessary picture-taking and delay! Fitted with new-type Achromar Precision Lens—individually focused, adjusted and tested. Shutter speeds for time exposures and 1/50-of-a-second snapshots; spy-glass-type viewfinder. Self-opening. Antique bronze finish. Clear, sharp negatives 1½" x 1⅛" that make excellent 3" x 4" larger-prints.

PRICES HIGHER IN FOREIGN COUNTRIES

## FREE BOOKLET

UNIVERSAL CAMERA CORP.  
Dept. 58, 32 W. 23rd St.  
New York City

Send me the free booklet checked below

☐ UniveX Minicam ☐ UniveX Cine "8"

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_

**UniveX**

## Photographing Children

(Continued from page 96)

thin, cheap silk (or tracing cloth), and is large enough to cover the front of the reflector.

The equipment should be all ready before the child or children are called in. If the background (wall paper or paint) is not of a comparatively soft shade and design in the room you are to use, then a plain white or light-colored sheet should be suspended over the wall for a background. You will find, as you progress, that a white background can be rendered photographically as any shade you wish, from white to very dark. This is governed by the light which falls upon it. The farther the lights and subject are away from it, the darker it will become.

For a start the model position should be about three or four feet from the background; the lights at least that far away again.

THE camera position will be governed by the amount you include in the picture and the angle, but for normal results should be at the eye level of the model. The camera should always be on a firm support or tripod.

Lay near the camera a few "props" in the nature of books or toys, but avoid having too many objects appear in the picture. Simplicity is one of the major attractions in a portrait.

Now bring in the child (or children). Play with the child, show him where you want him to stand or sit, but make no attempt to pose him. Get the child to forget the camera and become so absorbed in your conversation that he even forgets himself. A gentle reminder as to position may be introduced from time to time, but do not make the desired position of paramount importance.

Formal portraits with full attention apparently directed toward the camera are very little more difficult. You simply replace the interest-creating object with a story or with absorbing conversation. The little boy in the portrait was listening intently to a deeply interesting (to him) conversation on the habits of gophers.

The primary thing, of greatest importance to remember, is that portrait lighting should be simple. The light should come fundamentally from but one source. Although we shall assume you are going to use two lights, the first is placed relatively close so as to light the subject, but the second light is at a greater distance to light up the shadows cast by the former. These shadows should still be shadows, yet illuminated well enough to show a degree of "tone" on the finished print. The amount of light to throw into the shadows is determined largely by experience.

If the light is coming from two equal sources, each illuminating a side of the model's face, and if the secondary source is twice as far from the model as the first, then the light falling on the model's face from the secondary light is not one half as intense as that from

(Continued on page 111)

## CROSMAN SILENT .22 RIFLE

Adjustable peep sight  
**NO CLEANING  
ADJUSTABLE POWER  
LOW COST AMMUNITION**

Grooves inside barrel make the Crosman a real rifle with all the hair-splitting accuracy this term implies. Shoots bullet (pell) same diameter as .22 powder rifle, but silently, powerfully, with no recoil, using the terrific force of compressed air—same force U. S. Navy uses to drive 2000 lb. torpedoes. Marvelous for target, small game. Single and 20 shot repeater models. No license required. New "clickless" Forearm and Target Stock.

**SuperPells** Ask Your Dealer To Show You a Crosman  
Best for all .22cal. Airrifles. Heavier, longer, more perfectly formed (secret process), thus harder hitting and more accurate. Made to American standards by American workmen. Write for folder.  
**FREE BOOK**  
Containing important target and game shooting facts; also Crosman Catalog. Write:  
CROSMAN ARMS CO., Inc., 386 St. Paul St., Rochester, N. Y.



## FISHERMEN

GET THIS THRILLING NEW BOOK ON FISHING **Free!**

"Ozark Ripley Tells About Fishing." Page after page of thrills covering all types of angling—written by Ozark Ripley, master fisherman. Also valuable information on outboard motors and boats. Write for your copy. **Free!** JOHNSON MOTORS, 1311 Pershing Road, Waukegan, Ill.

## TYPEWRITER ½ Price

**Easy Terms  
Only 10¢ a Day**  
Save over ½ on all standard office models. Also portables at reduced prices.  
**SEND NO MONEY**  
All late models completely refinished like brand new. **FULLY GUARANTEED.** Big free catalog shows actual machines in full colors. Lowest prices. Send at once. Free course in typing included.  
231 W. Monroe St., Dept. 507, Chicago  
**International Typewriter Exch.,**

**Print Your Own**  
Cards, Stationery, Advertising, labels, paper, circulars, tags, etc. Save money. Sold direct from factory only. Does raised printing like engraving. **Print for Others, Big Profits.** Pays for itself in a short time. Easy rules. **Junior outfit, \$8.25, Senior \$17up.** Write for free details mentioning whether you are most interested in doing your Own printing or printing for Others. Kelsey Presses, N-33, Meriden, Conn.

**THE I. M. P. OUTBOARD MOTOR**  
An exact detailed replica of a famous racing motor—electrically operated by flashlight cells—1½ to 6 volt—single or series—2000 R. P. M.—Height 5 in. weight 5.9 oz.—prop. 1½"—for speed boats up to 24" or as **\$3.50** auxiliary for sailing models.  
Send 10¢ in stamps or coin for catalogue of steam, gas & electric motors, model airplanes, boats & trains—charts & guides—  
**INT'L. MODELS 251 W. 55th Street N. Y. C.**

**ENGINES**  
Enclosed, Self-Oiling, Roller Bearing  
Reliable power for farm or factory. Uses all fuels for pumping, sawing, etc. Best engine for the money. You Pay Less to Own it—Less to Run it. **Cash or Terms—Catalog Free.**  
**WITTE ENGINE WORKS**  
2225 Oakland Ave., KANSAS CITY, MO.

**ARC WELDER FROM OLD DODGE GENERATOR**  
"We Show You How"  
For light or heavy work. 75-200 amps. Single or twin. 35¢ brings complete plans and valuable catalogue listing over 500 electrical items. Over 100 other generator changes.  
**LeJay Mfg. Co., 323 LeJay Bldg., Minneapolis, Minn.**





3-IN-ONE oil is specially blended to keep moving parts clean, free from rust, and lubricated. Use it regularly on hinges, locks, sewing machines, tools. At hardware, drug, grocery and 10¢ stores.

**3-IN-ONE OIL**

**Free PHOTOGRAPHIC ALMANAC Just Out**



Now ready—Central's new Free 128 page Photographic Almanac—including (1) Special month-by-month Photographic Calendar, (2) Special article by leading photographic authority, (3) Handy Exposure table, film and plate speed table, Exposure Guide, (4) Over 100 pages of still and movie cameras, films, lenses, enlargers, chemicals—everything photographic—many at big savings and ALL GUARANTEED on 10 Day Money Back Trial. (Used equipment accepted in trade) Write for your Free Almanac now.



CENTRAL CAMERA CO.  
230 S. Wabash  
Dept. S-5  
CHICAGO  
Photographic Headquarters Since 1899

**OWN THESE ON TIME**

Nationally famous guns, pistols, scopes, cameras, etc., about 10% down; 10 months to pay. Big Handbook-Catalog, 96 pages, 8 1/2 x 11 in., fully illustrated, weighs about 1 lb., average mailing costs us 15c. Written by national experts, gives new easy payment plan, other buying helps. You need it. Postpaid for 50c (stamps). Write NOW. New Special Camera Catalog, 10c (stamps or coin).

**NATIONAL TARGET & SUPPLY CO.**  
DEPT. T-42; 1207 25th St., N. W., WASHINGTON, D. C.

**New Catalog of TRAILER PARTS**

Axles, straight, \$4. Drop center axle, \$7.50. Drop center axle undercarriage, \$19.50, complete less tires. Cable-controlled brakes, on axle, \$15 extra. Electric brakes—prices on request. Send for FREE Catalog today.

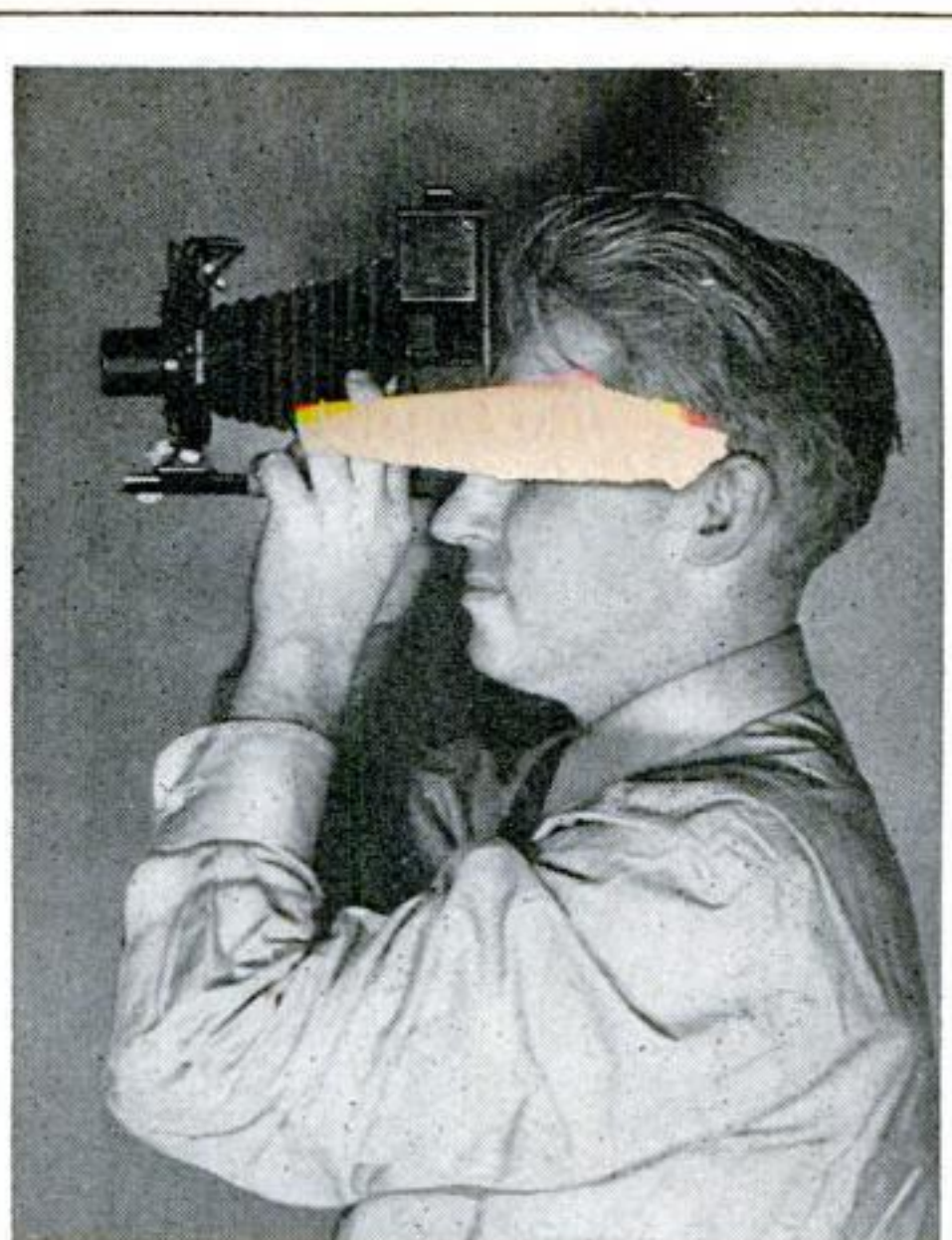
**SHAMROCK TRAILER PARTS**  
12317 Turner Detroit, Mich.

**ALL PURPOSE MOTO-TOOL**

**10 DAY MONEY BACK TRIAL** saves time and labor on all craft work. Everybody who works with his hands—at home, shop, school, or profession—can use the efficient, attractive Moto-Tool to advantage. With this practical machine you can do in seconds, jobs that require hours of hard hand work. Moto-Tool handles hair-line precision jobs or does power work with equal ability. Plugs in any AC or DC socket. Absolutely safe. Hundreds in use. Two fine models to choose from. No. 1 a sturdy 6 oz. machine—25,000 r.p.m. for light bench work. No. 2 a heavier, more powerful tool—13 oz. 27,000 r.p.m.—with extra mechanical features every craftsman will appreciate. Price \$16.50 postpaid. Order on 10-day trial. Money refunded if not more than satisfied. Send for FREE booklet, 20 pc. craftsman's tool set for all types of Moto-Tool work \$5.75 postpaid.

**DREMEL MFG. CO.**  
1129-CT Racine, Wis.

**ONLY \$9.85**  
SENT POST PAID



## A Simple Way to Check Camera Sunshades

DO YOU ever find your prints shading off toward the corners? One of the commonest reasons is that a homemade sunshade is too long or too narrow, and is thus cutting off some of the light that should be coming through the lens. Strangely enough, the view on the ground glass often will not clearly indicate this fault. If you are in doubt, a simple way to check your sunshade is to remove the ground glass, set the bellows at infinity, open the lens wide, and look through the lens from each corner of the ground glass opening. Hold the camera vertical, look directly forward, and keep your eye close to the normal plane of the ground glass. If you can then see the edge of the sunshade through the lens, you can be sure that it cuts off some of the light to your film, and it should therefore be shortened or widened.—K. M. S.

## Photographing Children

(Continued from page 110)

the first, but has only one quarter the intensity. This fact should be relied upon in determining the range of contrast you wish from highlight to shadow. (Negative development also controls contrast but will be overlooked, since only lighting is being discussed.)

The placing of the lights should be somewhat as follows: The dominant light, for normal effects, should preferably come from above. The well-established 45-deg. lighting is suitable for the beginner. This calls for the first and nearer light to be about 45 deg. to one side and 45 deg. above the model's head and, of course, in front of model. The second light is placed, for a start, about twice as far from the model as the dominant light, and about camera level. It is on the side of the camera (and model) opposite the dominant light. This second light is now in a good position, being lower than the first, to throw some light into the shadows cast on the face by the various features.

# MAKE YOUR PICTURES LIVE

**IN LIFE SIZE and FULL COLOR**

## WITH AN argus PROJECTOR

For owners of Argus, Contax, Leica, Retina, Bantam Spl. and all other 35 mm. Cameras.

With an ARGUS projector photography is more fun than ever before. There's a new thrill when you see your pictures on the screen in life size and full color. And everyone can now afford to own an ARGUS projector.

**\$15.00**

**MODEL CP**

The outstanding projector value—modern styling in beautiful finish. Has 4" high-precision lens; complete with 100 w. lamp and carrier.

**\$32.50**

**MODEL B**

Powerful projector of improved design with swivel head and tilting lever. Automatic film pressure release prevents scratching film. Complete line of accessories available.

**ARGUSLIDE KIT 75c**

Contains glass, patented binding stickers and film centering masks for making one dozen complete slides.

**ARGUSLIDE BINDER KIT**

Has complete materials for making 6 dozen slides plus the ARGUSLIDE binder for assembling and sealing slide glasses. **\$5.00**

**INTERNATIONAL RESEARCH CORPORATION**  
195 FOURTH AVENUE ANN ARBOR, MICH.





## A THIRD GRAND SLAM with GRAFLEX

Three grand slams in a row! That's the Graflex record for all three of the Annual National News Picture Contests. Since these competitions were inaugurated, every prize has been won with Graflex-made Cameras. This year, all five prizes were won with Speed Graphics—the cameras that are making prize-winning pictures for photographers everywhere. If you, too, want prize-winning pictures, get a Graflex-made Camera at your dealer's.



**FREE!** Send for our free catalog of Graflex and Speed Graphic American-made, Prize-Winning Cameras and Accessories. Paste coupon—or write your request—on penny post card, if you wish. Folmer Graflex Corporation, Dept. PS-18, Rochester, N. Y., U.S.A.

FOLMER GRAFLEX CORPORATION  
DEPT. PS-18, ROCHESTER, N. Y., U. S. A.  
Please send me your catalog of Graflex and Speed Graphic American-made, Prize-Winning Cameras and Accessories.

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_

**GRAFLEX**  
PRIZE-WINNING CAMERAS

**FREE** *SPRING CATALOG*  
*new spring catalog*

**READY, FANS!** New Spring number of the radio catalog supreme! Read about new Lafayette super receivers for 1938—advanced line of Lafayette Public Address—real “buys” in famous name cameras—everything in radio! Prices you can't beat anywhere. Send for this amazing **FREE catalog TODAY!**

Get **FREE** parts list on circuits described in this or any other magazine. Write now.

**WHOLESALE RADIO SERVICE CO., INC.**  
NEW YORK, N. Y. • CHICAGO, ILL. • ATLANTA, GA.  
100 SIXTH AVENUE • 901 W. JACKSON BLVD. • 265 PEACHTREE STREET  
BOSTON, MASS. • BRONX, N. Y. • NEWARK, N. J. • JAMAICA, L. I.

**WHOLESALE RADIO SERVICE CO., INC.**  
901 W. Jackson Blvd., Chicago • 100 Sixth Ave., New York  
(MAIL TO NEAREST WAREHOUSE)

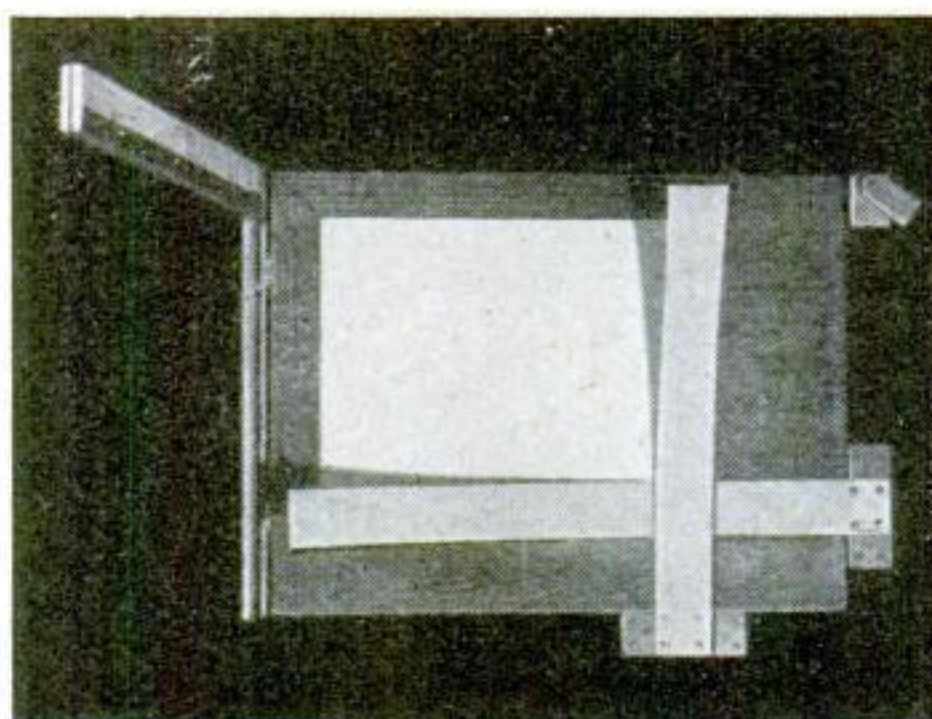
Rush the **NEW SPRING** Catalog No. 71-9E8 ☐  
Send **FREE** parts list \_\_\_\_\_

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_

PASTE COUPON ON PENNY POST CARD



Easel with paper in place ready for the hinged L-shaped frame to be fastened down

## Enlarging Easel Made at Trifling Cost

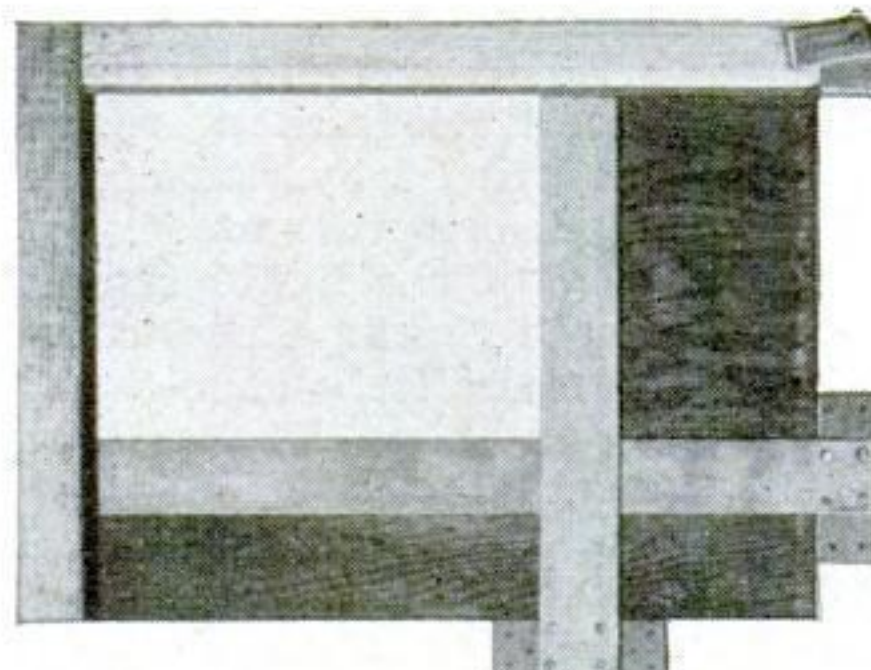
A **FLAT** door panel 14 by 18 in. was used as the base of this enlarging easel. At one edge is hinged an L-frame made of four pieces of wood, which are nailed together so that the top board of one side laps over the bottom board of the other side at the corner. The joint is glued and nailed or screwed to keep the legs at true right angles. The inside edges are lined with brass strips 1/32 in. thick and are ruled in inches. A small wooden clamp keeps the frame closed while enlargements are being made.



Each brass strip is mounted on a slide

The easel is adjusted to take any size of enlargement by means of 1/32-in. brass strips 1 3/4 in. wide. These are fastened to wooden slides. The metal strips are curved so that pressure is exerted on the paper when the ends are clamped under the frame. The edges of the strips must be absolutely straight.

In order to tell how far the paper is being placed under the frame so that various sizes of margins can be made, that portion of the easel under the frame is ruled with long lines 1/8 or 1/4 in. apart.—F. M.



Closing the frame holds the paper securely

## Waxing Ferrotypes Plates

FERROTYPE plates can be waxed by rubbing them with a crumpled sheet of thin waxed paper such as is used for wrapping sandwiches. The plates are then polished with a soft cloth.—H. L.

**I'M THE BEST GLUE AND THE CHEAPEST IN THE END**

**LEPAGE'S**  
*strength*  
FOUR FLUID OUNCES  
**LIQUID GLUE**

The household “utility-man”.  
For craftsmen and manual training.  
Use for fixing and repair work.  
In bottles, tubes and cans.

**MULTI-COLOR TYPELESS PRINTER**  
Semi-Rotary... Prints in SIX COLORS at once.  
PRINT YOUR OWN stationary, circulars, etc.  
No experience necessary. Money back guarantee. Samples of work FREE.

**MULTI-COLOR-A** 122 East 25th St., New York

**SHIP MODEL KITS**  
\$1.50 and up  
Also Blueprints—Woods—Tools—And hundreds of Scale fittings in White Metal, Brass and Boxwood.  
Send 15 cents (will be refunded) for this Catalogue to  
**GENE'S** 510 EAST 11 STREET  
Dept. P. S., New York City

**HYLYTE**  
PENETRATING  
SULPHURIC ACID

**Ends Storage Battery Recharging Expense INCREASES BATTERY LIFE**

Treat your old or new battery with Hylite Penetrating Sulphuric Acid—and end battery recharging expense. Increases battery life and insures fullest capacity operation at all times. Prevents corrosion from becoming an insulation. Maintains full chemical action for life of the battery. Send \$1.00 for complete Battery Treatment. Satisfaction guaranteed.

**HYLYTE LABORATORIES, 2007 W. Grand Ave., Dept. PS-5, Chicago**

**ARMY SIGHTING LEVEL**

A compact scientific and useful instrument, size 5"x1" for landscaping, grading, surveying, laying out shooting ranges, etc. Made in U. S. A. by leading instrument maker to sell at approximately \$5.50. All brand new and guaranteed accurate. Send postpaid for only \$1.00. C. O. D. 15c extra.

**F. C. MEICHNER CO., 93 Federal St., Boston, Mass.**  
Binoculars Repaired, Bought & Sold

**NOW ONLY \$5.00**

Over 6,000 GHQ Gas Engines have been sold at \$8.50 for the Kit and \$12.50 for the finished motor. Now is your chance to buy the New Improved kit for \$5.00 or the assembled motor for \$10.00. Send \$1.—Shipped Exp. Coll. for balance same day. Catalog 3c. Dealers WRITE.

**GHQ MOTORS, 854S East 149 St., New York, N. Y.**

**ELECTRIC EYE**  
Control Unit Kit

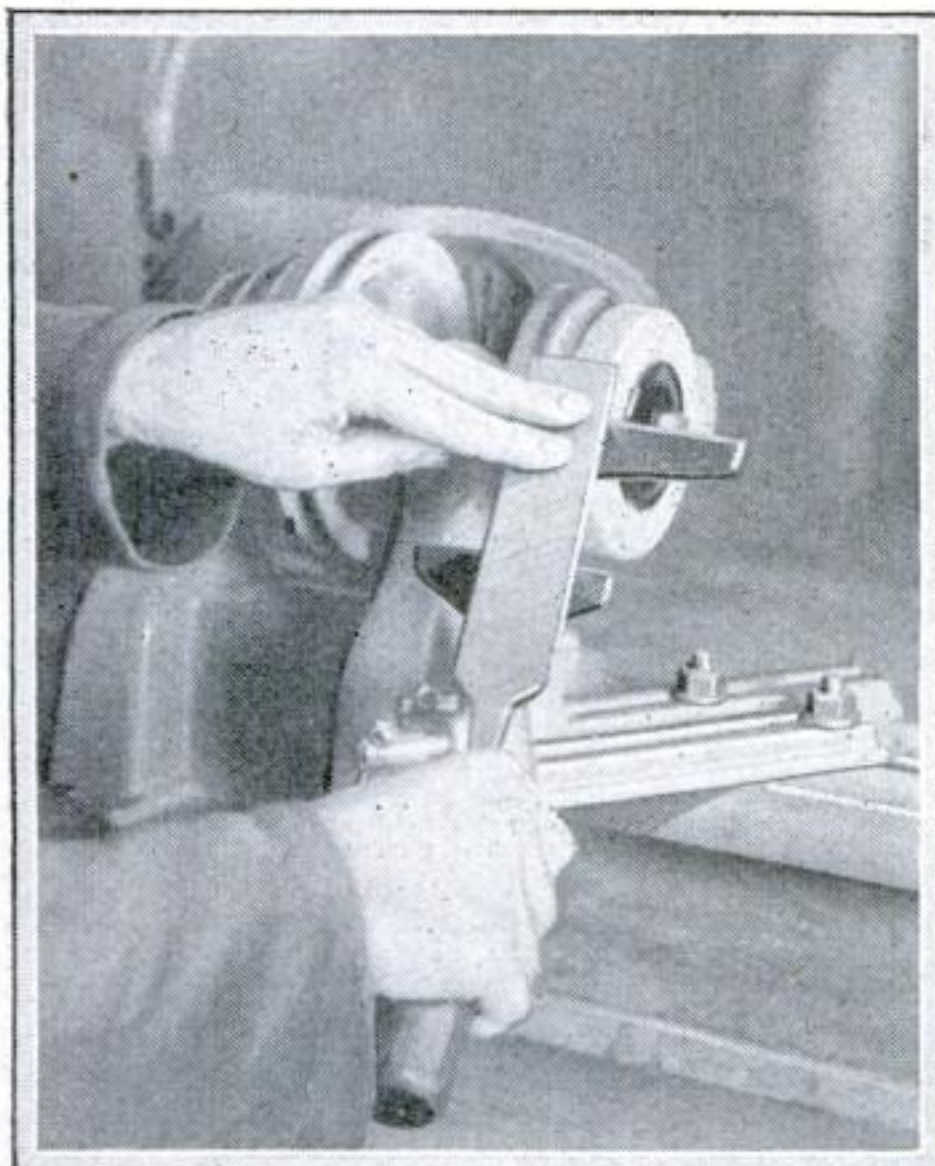
Complete kit, with wiring instructions \$5.98. Completely wired ready for installation \$8.95. Operates on 110 V. AC-DC (Not a toy but proven equipment). Used for light controls, alarms, signals, door openers, and many other electronic applications. Terms 1/3 cash with order, balance C.O.D. Consult us on your electronic needs. We build to your specifications.

**Electric Eye Devices Co., Dept. B, 51 E. 125th St., New York, N. Y.**



## Chisel-Grinding Guide from Two Tool Rests

A GRINDING wheel mounted in a wood turning lathe and two lathe tool rests have been used by the writer for some time in putting true, even bevels on carpenter's chisels, turning gouges and skew chisels, plane bits, and other cutting tools. Being adjustable, the tool rests allow any angle to be set.  
—R. W.



This ingenious combination of two tool rests forms an adjustable grinding guide for tools

## Attic Ventilating Fan

(Continued from page 73)

It is recommended that ball-bearing thrust washers be placed between the fan hub and the motor frame to take the fan-blade end thrust. Such a bearing may be purchased from home-workshop supply houses or some gear manufacturers for less than fifty cents.

The motor mounting will depend somewhat on the builder's own plans. The support shown was made from a piece of 1-in. pipe fitted inside a piece of 1½-in. pipe. A pipe flange was screwed to the bottom of the 1½-in. pipe, and another pipe flange on the top of the 1-in. pipe. The motor was attached to a wooden base by rubber mountings. The height of the complete unit is adjustable and can be maintained by set screws in the 1½-in. pipe section.

The fan should be installed in a window or suitable opening in the attic. If possible, select a window on the side of the house away from the prevailing winds and where there will be no serious interference with the draft from the attic passageway to the rest of the house. Locate the unit so that it will not prevent the raising or lowering of the window in case of a severe storm.

The best plan is to construct a wooden frame to cover the window frame, with a hole to clear the diameter of the fan blade. The one illustrated was made of ¼-in. plywood. It is set out with spacers so the window can be closed easily.



## ADRIFT WITH DYNAMITE on STORM-TOSSED BARGE!

MACKENZIE ON RAMPAGE, SENDS LONE  
BARGEMAN TOWARD ARCTIC ICE

"My home was the barge, anchored in the middle of the Great Bear River, which we used in transhipping freight for Radium City into the small high-powered rapids boats," writes T. H. Inkster, F.R.G.S., writer, explorer, British war time flyer.

"One night, with the barge loaded with freight including hundreds of cases of dynamite, a terrific storm blew up, my anchor dragged. Bobbing like a cork the great barge was swept down toward the broad Mackenzie. It pitched against the bank with a force that threw me off my feet, and started on again.



"Once in the Mackenzie I'd be Arctic-bound! Somehow I must get a line on shore. It seemed impossible, but I yelled at the top of my lungs... I heard dogs barking. Then as I flashed my light on the shore, a trapper who was camping near by came running down to the water's edge.

"I heaved the line for all I was worth... the trapper got it! Then I focussed the light on a big tree while he made it fast. Later, we had a good laugh over it... but right then I fully realized that but for the trapper's help and my *fresh* DATED 'Eveready' batteries I would have been drowned or blown to bits when my barge drove on the rocks downstream!"

(SIGNED)

*T. H. Inkster*

**FRESH BATTERIES LAST LONGER... Look for the DATE-LINE**

NATIONAL CARBON COMPANY, INC., 30 East 42nd Street, New York, N. Y.



## ★ NEW BOOK CRAFTSMEN SHOULD HAVE ★ 100 PAGES—NO. 10—MAKE BEAUTIFUL FURNITURE



**10c**  
Rebated  
on first  
order.

at a fraction of store cost. 14 pages of lumber with prices. Veneers and plywoods of all woods cut in usable sizes without waste. USE THE CRAFTSMAN new process of inlaying, using our new process ART INLAY GLUE, needing no clamps for the finest work. Hard-to-find rare grains for all woods, including foreign—special hard-to-find hardware, mouldings, turned legs, etc. Lists and illustrates 76 blueprints of scroll patterns, inlay table tops—Kits for inlaid art boxes, plaques, trays, book ends, etc. that anyone can make—22 pages in color. **VENETIAN BLINDS** for one-third of usual price. All material requiring only a saw, screw driver, a tack hammer and paint to assemble.

**CRAFTSMAN WOOD SERVICE CO. 2734 MARY STREET CHICAGO**



# FREE Block Briar carve it yourself



Fashion It Into a Head,  
a Football or Any Shape You  
Desire.

Many smokers are carving their own individual styles of pipes, and you can, too, without cost. Send wrappers (or facsimiles) from three 15¢ packages of John Middleton's Club Mixture (on sale at your dealer's) with your name and address and we will send you absolutely free a GENUINE BLOCK BRIAR PIPE. No obligation. Other pipes are in this form, before they are finally fashioned. Club Mixture is the NEW POPULAR-PRICED TOBACCO so many smokers are talking about. A genuine BLEND containing many types of tobaccos, including the rare, imported Latakia, seldom found in any but most costly blends. Three packages will convince you it's your "steady-diet." If your dealer hasn't it, send 45¢ to John Middleton, 1211 Walnut Street, Philadelphia, Pa., with your dealer's name.

**Free!** MONEY-SAVING CANDID CAMERA  
Catalog No. 235 . . . brand new! Lists hundreds of "Saving" items — Save Money on Candid Cameras, Enlargers, Still Cameras, and Accessories. Write for this remarkable Bass Bargainingram and check your photographic needs . . . acclaimed the best candid camera list of all times. WRITE DEPT. P. S.

**Bass CAMERA CO.**  
179 W. MADISON ST., CHICAGO, ILL.

**Wind Electric Plant**  
Build Your Own—We Show You How!  
Make auto generator light buildings, play radio, run washing machine and other motors from FREE WIND POWER. Earn money making for others. Dime brings complete building plans and 1938 catalogue listing over 500 windcharger elec. items. Most complete windcharger catalogue; welders, electric fence, etc., 100 other generator changes into 8-12-32 and 110 volt plants. Satisfaction guaranteed or dime refunded.  
**LEJAY MFG. 423 Lejay Bldg. Minneapolis, Minn.**

**YALE OIL**  
Made by YALE, maker of famous locking devices

**THE BETTER LUBRICANT and RUST PREVENTER**

Scientific tests proved the supremacy of this heavier bodied, finer quality oil for lubricating and rust-proofing. YALE OIL has a remarkable affinity for metal. Its amazingly strong film resists "air punctures", protects longer—ideal for electric motors, tools, machines, and general home use. It stays put—does not drip from bearings. Insist upon YALE OIL.

Used for 25 years on the world's finest bank vault mechanisms!

In handy tubes, 10c, 15c and 25c. At hardware and sporting goods stores. If your dealer can't supply you, send 10c and we will mail a tube postpaid. Address Department O.S.

**THE YALE & TOWNE MFG. CO.**  
STAMFORD CONN.

## Police Cameras Reveal Crime Clews

(Continued from page 31)

used on previous films, has been made available to photographers. With such films and the fast lenses now available, a detective can take pictures which are fully exposed, and yet stop all action even on dark or rainy days or in comparatively dim interiors. It adds greatly to his chances of getting his man—on film.

THE latest color films are also playing a part in convicting the guilty. Not long ago, a jury was sitting on a case in which a child had been beaten atrociously. Conviction was quick after colored movies were admitted to the evidence. They revealed the discolored flesh where the little girl had been struck again and again.

But the camera is as quick to free the innocent as it is to convict the guilty. Take one striking instance reported from a western state.

A woman was on trial for the murder of her husband. Her story was that he came home drunk and threatened her with a revolver. During the struggle on the front lawn, she swore, the gun went off accidentally and he was killed. The district attorney, however, maintained that she shot him as he came up the walk, firing from inside the house through a screen door. The whole case hinged on proving or disproving this latter statement.

The trial reached its climax when defense attorneys handed the jury a sheaf of photographs. Each was the picture of a bullet. All except one had criss-crossing marks in the lead. Time after time, the bullets had been fired through screens into oak boards. In spite of the fact that the wood is far harder than a human body, the recovered bullets always retained the imprint of the wire mesh. Yet, the photograph of the fatal bullet showed no such markings. The camera, more clearly than hours of talking, proved that the lead which killed the victim could not have been fired through the screen door. The case for the prosecution collapsed; the woman was given her freedom.

THE whole science of forensic ballistics, or tracing bullets to the guns that fired them, is based on taking pictures through comparison microscopes. In many other ways, the camera records in permanent form the findings of the different sciences applied to criminology. It records fingerprints, scars and wounds, the position of footprints, teeth marks, forgeries, mutilated documents, and other pieces of evidence which aid in the solution of crimes.

Recently, newsreels have helped identify rioters, and fast cameras have snapped "repeaters" at the polls. One of the latest applications of photography to police work is the assembling of large albums of pictures, showing hundreds of known pickpockets, footpads, and

other underworld characters who follow fairs and conventions. By familiarizing themselves with the faces of these undesirables, the local police in a city where an exposition or convention is to be held can increase their chances of nabbing criminals before they can get into action.

Trapping insurance racketeers is another phase of the camera work of modern detectives. One example will illustrate the methods used.

IN Maryland, a mason took out a large accident-insurance policy. Only a few weeks later, he reported he had had a bad fall and had injured his right arm so severely he was no longer able to work. Company physicians examined him. Beyond a few minor bruises, they could find nothing wrong. However, the laborer insisted he could bend his elbow only with extreme pain and demanded the payments called for in the policy.

This was the situation when a camera detective, employed by the company, reached the town in which the mason lived. For days, he shadowed the quarry with his miniature outfit slung in its ever-ready case. Always, in public, the laborer's arm remained as stiff as a steel shaft. Early one Sunday morning, however, the injured man appeared in his back yard with a heavy hammer and began pounding down a row of bean poles, unaware that a hidden camera was recording him at work, bending his right elbow without effort at each lift of the hammer. That one set of pictures nipped his attempted fraud in the bud and saved the insurance company hundreds of dollars.

Telephoto lenses, which permit the recording of such pictures from a distance, have been used effectively in several cases. They give close-up views while permitting the photographer to snap the pictures from a distant hide-out.

EVEN aerial cameras, pointing down from the sky, are being enlisted in the scientific war on crime. Some months ago, a silver-winged plane zigzagged back and forth across Long Island Sound while the aerial camera it carried snapped picture after picture. It was recording "submarine" shots in search of a vital clew in a kidnap case. The resulting negatives recorded objects lying many feet below the surface of the water. Although this sky hunt failed to reveal the body of the victim, the unusual procedure opens up new possibilities for rapid searches of the kind. Photographs taken from an altitude often reveal valuable clews not evident to the ground observer.

Occasionally, luck as well as foresight plays a part in solving crimes by photography. When a policeman was making his rounds in the park

(Continued on page 115)





● PADDLE the peaceful paths of beauty — with rippled reflections and dreams. Spend peaceful days on the waterways. Glide through the glories of Nature.

An Old Town Canoe is easy to paddle. Quick to respond to the blade. True Indian lines — made steady and strong. Built for long years of hard use.

**FREE CATALOG** shows all kinds of Canoes for paddling, sailing or outboards. Also Outboard Boats, including big all-wood family boats. Rowboats. Dinghies. Write today. Address Old Town Canoe Company, 415 Main Street, Old Town, Maine.

*"Old Town Canoes"*

**COLUMBIAN METAL BOATS**

Light weight, durable, carefully built boats at remarkably low prices. Made of toughest galvanized copper bearing steel. Wood gun-wales. Heavy transoms for outboard motors. Two or more built-in air chambers for extra buoyancy in case of upset. Real wave riders; easy to handle. Never leak or warp. Always ready for use. Both round and flat bottom boats; all sizes and styles.

Write For Free Boat Booklet with description and prices of complete line of metal boats—knockabouts for fishermen, light weight lively boats for parks and resorts, heavy duty craft for outboard motors.

Dealers Wanted—who can develop volume sales.

**COLUMBIAN STEEL TANK COMPANY,**  
P. O. Box 4226C Kansas City, Missouri

**FREE BOOK**

**New, Larger Sudbury SOIL TEST KIT \$2.00**

Complete with instructions and data on plant needs

Use this kit and be your own soil chemist. New larger model gives 20 individual tests for nitrogen, phosphorus, potash and acidity, giving all essential information for successful lawn or garden. If not sold by your dealer, send \$2 direct to manufacturer.

**SUDBURY SOIL TESTING LABORATORY**  
P. O. Box 682, South Sudbury, Mass.

**POWERAY**  
New 6-volt electric lantern.  
80-100 hours light. 700 ft. beam. 4½ inch reflector.

**Buy ONE OF THESE "BIG LITE" DELTAS**

**\$1.50 LESS BATTERY**

**POWERLITE**  
6-volt. Deluxe electric lantern. 800 ft. beam. 80-100 hours light. Two reflectors. At sport and hardware dealers.

**DELTA ELECTRIC CO.,**  
Dept. 400

## Police Cameras Reveal Hidden Crime Clews

(Continued from page 114)

of a large eastern city, not long ago, he discovered a girl slumped on a bench, one arm hanging limply, a revolver resting on the ground below the lifeless hand. It had all the appearances of a routine case of suicide.

And so it remained until the police photographer developed the negatives of pictures he had taken at the spot. In the slanting rays of the early morning sun, a faint covering of dew stood out clearly on the bench. And, on the seat next to the girl, there were revealed sharp outlines in the dew that proved beyond doubt that some one had been sitting there shortly before the policeman had arrived. Detectives abandoned their suicide theory and turned to a check-up of the girl's acquaintances. As a result of this hunt, the murderer was identified, captured, and brought to trial.

IN Rio de Janeiro, an Englishman was accused of the murder of a Brazilian acquaintance with whom he had quarreled violently a few days before. On the day of the victim's death, their differences apparently had been patched up and the two went sailing together in a small boat in the harbor of the city. When the boat returned to its mooring, the Brazilian was dead. He had been killed, the Englishman said, by a fall from the masthead to the deck.

Police, however, noted that a heavy oar was missing from the boat's regular equipment. Medical experts testified that death resulted from a blow on the head which could easily have been administered by the oar. Details of the quarrel were aired in court and the case looked hopeless for the Englishman until defense attorneys introduced one of the most remarkable pieces of evidence ever produced in court. It was an enlargement from a casual snapshot made by a tourist.

On the day of the Brazilian's death, a cruise ship had steamed into the harbor at Rio. One of the passengers, impressed by the view, snapped the picture with his camera. When the film was developed and enlarged, it contained positive evidence that the Englishman's story was true and insured his acquittal. For the film revealed a dark blotch on the sail of a boat which, by sheer chance, had been within the camera's range. The enlargement proved that the dark spot was the body of a man falling from the masthead past the white sail to the deck!

THUS, by chance and by design, the camera is playing a vital part in furthering justice. It is a powerful new weapon in the hands of the police, a weapon which is being used for new tasks from month to month, a weapon the underworld does not know how to fight. Every criminal who hides his face from the piercing eye of a camera, pays tribute to its worth as a potent aid on the side of law and order.



## SHARP CLAWS

*for sure grip*

The Plumb meets the supreme test of a nail hammer. Sharp beveled claws nip into nails, grip tight, pull heads through wood!

Claws with slight roll across back, catch closely driven nails. Crowned face protects work from nicks, dents.

Handle has slim neck, absorbs shock! Comfortable grip with flared end to prevent slipping.

Head and handle in perfect balance. Feel how the Plumb rises, falls, with natural swing of your arm! See Plumb's Patented Take-Up Wedge. Keeps head tight on handle merely by a turn of your screwdriver. Better work of all kinds with the Plumb.

Ask your hardware dealer for a Plumb! With the Red Handle and Black Head.



FAYETTE R. PLUMB, INC., PHILA., U. S. A.





Rust and scale have accumulated in your radiator all winter. They are choking the delicate veins that circulate water and keep your motor cool. An overheated motor is a lazy motor. And overheating may cause costly damage. Clean out your radiator. It costs only 10c. (25c for the largest trucks and tractors.)

You can do it yourself in a few minutes. Pour a little SANI-FLUSH in the cooling system. Run the engine. (Follow directions on the can.) Then drain, flush and refill with clean water. Do this regularly, twice a year. Keep the radiator clean and clear. Motors run cooler. Save power. Save repairs. SANI-FLUSH can't harm motor or fittings. You'll find SANI-FLUSH in most bathrooms for cleaning toilets. Sold by grocery, drug, hardware, and five-and-ten-cent stores. 25c and 10c sizes. The Hygienic Products Company, Canton, Ohio.

**Sani-Flush** *Safe*  
KEEPS RADIATORS CLEAN NOT CAUSTIC

**NEW Plastic Elastic!** **MENDS 100 THINGS** SAVES \$\$\$\$  
**FREE BOOKLET** FLEX-O-FIX—Contains Water—EASY TO USE. Just apply from tube—dries tough and elastic. MENDS: rubber, leather, cloth, etc. MAKES: moulds, washers, packing, etc. INSULATES: electric wires—no tape required. 10c, 25c, 60c tubes. **WRITE NOW** for FREE BOOKLET showing hundreds of every day uses. Buy a tube Today! Ask for FLEX-O-FIX at auto supply, hardware, sporting goods, variety stores. If not available locally send money and dealer's name to—  
Frund Products Co., Dept. P58-43 E. Ohio, Chicago

**NOW, GET REAL RESULTS WITH YOUR ELECTRIC RAZOR**

Set-Up makes any electric razor shave **close & clean**. Rub on beard, let dry, then shave.

**\$1 MONEY BACK GUARANTEE**

**PINAUD PARIS SET-UP**

## Riches from the Wind

(Continued from page 55)

To a hard-headed business man, this stage would have marked the time to cash in. But the brothers reasoned that if their propeller design was good enough to run a six-volt generator for charging radio and automobile batteries, it could be made to work equally well on a thirty-two-volt charger for light and power on the entire farm. So, in the course of time, they had a twelve-foot propeller which, by their road test, was the best they had so far whittled out.

TO GIVE it a real trial, they needed a tower high enough to get the propeller above houses and trees. They talked their father into buying a supply of strip steel and several hundred feet of wire rope. They even persuaded him to help them drill hundreds of holes in the strips and bolt them together. When the job was done, they had a tower of novel design, extraordinarily sturdy and economical. They sell towers like it today at only forty cents for each foot of height.

Mounted high above the farm, this pioneer generator plant supplied ample current for every purpose of light and power. It is still there, still doing its job, unchanged since first it was erected. It has cost nothing for upkeep—or for anything else—beyond a few drops of oil occasionally for the generator and a yearly coat of paint for the propeller.

For the average farm, the thirty-two-volt set gives all the light that is needed, runs separators and other farm machinery, operates shop tools of moderate size such as grinders, and all the ordinary household equipment—washer, vacuum cleaner, radio, sewing machine, and electric irons. It is not intended for use with electric ranges or refrigerators, or for running silo-filling machines or anything else requiring motors above one horsepower.

Each development called for a new invention. The high-speed propeller, for instance, was fine—except that in a high wind it might dash itself to pieces. The boys had to settle down and develop an airfoil spoiler, which in plain language is a form of brake—but without friction—to keep the blade from running too fast in a high wind.

IT WAS clear to the brothers that they needed a lot of cash to carry out their plans. To produce it they spent their last cent to build an ice boat powered with an automobile engine to drive an airplane propeller. They finally sold it for less than it cost them, and meanwhile lost a lot of precious time. What could they do next to provide cash?

The five-foot propeller they had erected on the storm-racked tower several years before was still giving good service in charging radio, car, truck, and tractor batteries. Such propellers should be salable. They inserted in the

(Continued on page 117)

classified sections of Iowa farm papers a four-line advertisement which read, "Let the wind keep your radio and auto batteries charged on electricity made with old auto generator and our propeller. \$3.50. Wincharger, Cherokee, Iowa."

On the first day, the rural mail carrier brought one order with a remittance for three dollars and a half. Next day he brought several more. Soon he was averaging six a day, then eight, then ten. The brothers were whittling like mad, and hired a neighbor boy to help them.

WHAT the customer received for his money was simply a propeller, with a set of printed instructions telling how to hook it up to whatever old automobile generator the customer might have, and how to mount the unit on a pole, roof, or tower.

More money was coming in to the Albers farm in every day's mail than had previously been seen in an average month. The boys had accumulated better than a thousand dollars in the bank. Their advertisements appeared in farm papers throughout the Middle West. They were often two weeks behind in their shipments. Then they decided to quit the business until they could develop a machine to turn out propellers.

Nobody knew how to help them. They hunted up experts on woodworking and learned that every attempt to develop a machine for shaping airplane propellers of wood, beyond a preliminary roughing-out, had been a failure.

Undaunted, however, they went ahead with their work. They made cutters of stray bits of steel salvaged from junk heaps, and tied their machine together with carriage bolts. They hitched it by a belt to the tractor outside their workshop window, and fed in a piece of wood. The thing practically blew up.

THEY drove over to Sioux City to ask the superintendent of the sash-and-door mill what they had done wrong. After a little discussion they found they had omitted a chip breaker, which is absolutely necessary in a wood mill. They went home, bolted their machine together again, and put in a homemade chip breaker. It worked! They had developed a machine which all the woodworking experts had told them was both practically and theoretically impossible. It was essentially the same as the machines which today, fashioned of alloy steels from details worked out by machine-tool designers, are turning out the hundreds of propellers which the brothers sell every day.

Their propeller goes through the machine only once, the device making a finished cut in one operation. After this it requires only sanding before painting. To the best knowledge of the brothers and their patent attorneys, there is no





## Making Money With Your CAMERA

Here is a brand-NEW, exceptionally practical manual which will teach you many kinks and tricks, ways and means to take and sell pictures. Written entirely for the amateur or semi-professional camera hobbyist, it clearly demonstrates by pictures and directions the principles of picture taking that bring you photos which are marketable—and how and where to sell them.

### COMPLETE, FASCINATING Easy To Understand

The ingenious amateur who can learn how to apply some of the simple rules in this book can make enough money with his camera to pay for all his photographic activities, and lay aside some welcome profit as well.

### THE TWENTY FIVE SECTIONS

of the manual cover such subjects as: Photography Isn't Difficult; Salable Pictures of People; Dollars From Architectural Photography; Pictures For Publication; Pictures For Rotogravure Sections; Ventures In News Photography; Syndicating Photographs; Pictures For The Magazines; Landscape Dollars; Selling Photographs To Manufacturers; Developing and Printing For Others; Miniature Camera Possibilities; Lantern Slides and Their Relatives; Salvaging Old Photographs; Still-Life Photography; Photographic Novelties; Accidental Profits; Nature Photography; Movie Profits; Coloring, Retouching, etc.; Invisible Light Magic; What About Stereo Photography?; Useful Accessories You Can Make; Miscellaneous Information.

### Send No Money Now— Just Coupon

We will mail C. O. D. You pay Postman. You risk nothing because OUTDOOR LIFE publishes this book, and will absolutely make good if you are dissatisfied.

Popular Science Monthly  
353 Fourth Avenue, New York

Dept. 58

Send me MAKING MONEY WITH YOUR CAMERA. I will pay Postman \$2.00 plus a few cents postage when the book arrives. You guarantee to return my money if I send the book back in ten days. (If you prefer to enclose cash, send \$2.00).

NAME.....

ADDRESS.....

CITY.....STATE.....

Orders from outside U. S. must be accompanied by \$2.00

## Riches from the Wind

(Continued from page 116)

other successful machine for making wooden propellers.

Three times, in pushing their way to a successful solution of their privately discovered problems, Gerhard and John Albers went completely and thoroughly broke. They had started with only a few dollars apiece. They used these up in their earliest experiments with the airfoil propellers. Next they reached, through pursuing their iceboat will-o'-the-wisp, a state which in anyone of greater financial prominence would have brought on bankruptcy. Finally, after making more money than they had ever before seen and saving it faithfully, they gambled the entire sum and the limit of their credit in building the machine for shaping propellers.

WHEN they emerged, flat broke and triumphant, they really had what they had begun groping for in undefined fashion six years before. Now they had proved there was a demand for their propellers and had a machine which could meet any conceivable demand. It was time to harness these together into a source of income.

They found in Sioux City, the nearest big town, some one who could provide financial backing and selling experience. They rented a factory, put their advertisements in the paper, and began turning out their chargers several times as rapidly as ever they had done in the whittling days on the farm. They induced a leading maker of automobile generators to manufacture a generator especially designed for their outfit, and they bought it in carload lots. They sold the entire rig—propeller, generator, tower, and all—wherever they could find a good market. But they did it so far off in the back lanes of trade that anyone who did not read the farm papers or live in a little town far away from the main highway was unlikely ever to have heard of them.

They had reached this stage when their success brought the radio engineer and finally his company's president. The Albers brothers had their ideas of what the business was worth, and their visitors agreed with them. First they sold a half interest, but after a year they merged their corporation with the radio company and took stock for their share.

THEY are making several thousand small sets a month for charging radio and automobile batteries. They are also making big sets for powering farms and industrial operations in isolated spots. At a conservative estimate, between 750,000 and 1,000,000 people are enjoying wind-made electricity from their outfits. They have sold sets in every state of the Union, in every province of Canada, and in nearly every country of the world. Now they are thinking in terms of even larger markets where coal is scarce and winds are steady.

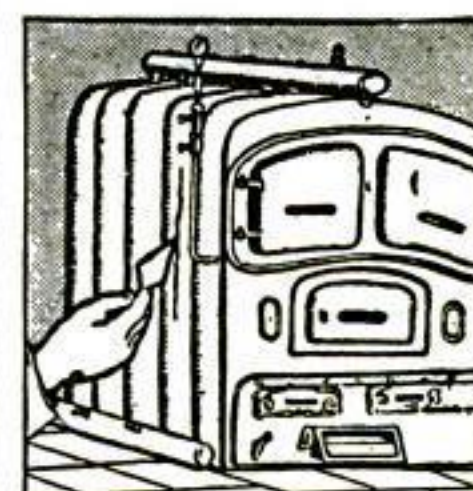
## CAN YOU USE an EXTRA \$10.00 to \$25.00?

This FREE booklet  
will show you how  
to get it easily



HOLDING onto money you already have is as good as making more that would have to be spent. You can easily save the amount indicated or possibly much more every year by making with Smooth-On No. 1, the repairs for which you otherwise employ a professional "fixer."

For instance, where a pipe, tank or water heater leaks, a heating boiler cracks, any kind of a pressure joint opens, a lock or hinge comes loose, screw threads or nuts strip, a handle won't stay on, or a leak or loose part appears on your car, you can



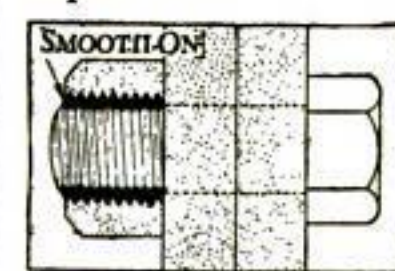
Stopping leaks

usually make a perfect repair with Smooth-On at a cost of only a few cents for material, and no labor expense or delay.

Smooth-On hardens into solid metal, but is easily applied with the simplest of household tools and without heat or fire risk.

Judiciously made Smooth-On repairs are dependable and permanent, and usually make the performance of the repaired part fully equal to that of a renewal that would cost far more and in addition involve the labor of replacement. Even an emergency Smooth-On repair will at least tide over until a permanent repair can be made with greater convenience and at lower cost.

The free Smooth-On Repair Book gives complete instructions with diagrams for making the commonest household and auto repairs in the easiest and most effective way. Every "handy man" should have a copy of this booklet and a can of Smooth-On in his repair kit.



Making stripped threads hold



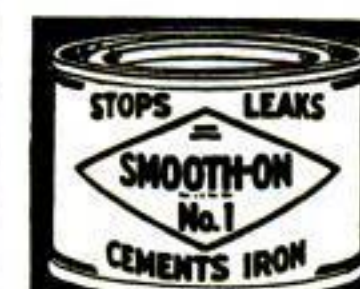
Tightening loose handles

Be ready for emergencies. Mail the coupon for this free booklet and get Smooth-On No. 1 in 7-oz., 1-lb., and 5-lb. can from any supply store, or if necessary, direct from us.

SMOOTH-ON MFG. CO., Dept. 58.

574 Communipaw Ave., Jersey City, N. J.

Please send Smooth-On Home Repair Book.



Name.....

Address .....

5-38 .....

## Do it with SMOOTH-ON

### SHOOT BENJAMIN GENUINE COMPRESSED AIR PISTOLS WITH SAFETY

For Target & Small Game—Economical—Accurate—Practical—Adjustable Force—Amazing Maximum Velocity—Safe. Single Shot with Bolt Action—Hammer Fire—Hair Trigger—Safety—cal. 177 or 22 or BB Price \$7.50, Holster \$2.00. Also 177 and 22 Single Shot Air Rifles \$7.50—Single Shot BB Air Rifle \$6.00—25 Shot BB Repeater Air Rifle \$7.50—at Dealer or Direct—No license required—SAFE. The Only Genuine Compressed Air Pistols & Rifles for Shooting BB on the Market. Full Details—Targets—Free—Write Today for Introductory Offer.



\$7.50

BENJAMIN AIR RIFLE CO., 853 Marion St., St. Louis, Mo., U. S. A.





# Self-Smoothing Kyanize

**LUSTAQUIK  
ENAMEL**

For bright, colorful, durable and waterproof furniture, wood-work, wicker and metal surfaces, indoors or out. A self smoothing enamel. Easy to apply. Dries in 4 hours. Leaves no brush marks. All newest colors. Write Dept. 843 for booklet, Free. BOSTON VARNISH COMPANY, Everett Station, Boston, Mass.

## FIREWORKS

1¢ POSTCARD will Save YOU many DOLLARS

**FREE! LOOK! FREE!**  
100 'Fort McHenry' SALUTES FIRECRACKERS \$3.25 worth of for only \$1.50  
Full of LOWEST PRICES on 'America's Best Fireworks'

GUARANTEED SAVINGS ON EVERY ITEM AT  
**BALTIMORE FIREWORKS CO., INC.**  
6900-02-04-06-08 EASTERN AVE., BALTIMORE, MARYLAND

## BUILD THE CUTTY SARK!

10¢ FOR COMPLETE CATALOG  
COMPLETE \$2.50 PLUS 15¢ POSTAGE  
Everything including CARVED WOOD HULL, Printed-Balsa Decks, Cast Metal: Life-boats, Anchors, Bitts, Steering Wheel, Chains, Masts, Spars, Rigging, Cement, Colored Lacquer—Full-Size Plans and Instructions.

**IDEAL AEROPLANE & SUPPLY CO., INC.**  
28 WEST 19TH STREET, NEW YORK

## FREE CAMERA CATALOG

IT'S OUT. Camera Fans—new Spring edition of the catalog that saves you REAL money! Latest type cameras, famous names, everything you need in photography at prices you can't beat anywhere! Don't buy that camera until you've seen this valuable FREE catalog. Mail the coupon for your copy today. Camera! Action!

**WHOLESALE RADIO SERVICE CO., INC.**  
NEW YORK, N.Y. • CHICAGO, ILL. • ATLANTA, GA.  
100 SIXTH AVENUE 901 W. JACKSON BLVD. 265 PEACHTREE STREET  
BOSTON, MASS. BRONX, N.Y. NEWARK, N.J. JAMAICA, L.I.

**WHOLESALE RADIO SERVICE CO., INC.**  
901 W. Jackson Blvd., Chicago • 100 Sixth Ave., New York  
(Mail to nearest Warehouse)

Rush NEW FREE Catalog No. 71C-9E8

Name.....

Address.....

City..... State.....

PASTE COUPON ON PENNY POST CARD

## DRESS YOUR OWN LUMBER—SAVE \$ \$



12" x 4" cap. Thickness Planer  
Finished lumber from low cost rough stock in your own shop with a Boice-Crane 12" x 4" Thickness Planer. Save planing cost and waiting at the mill. Pays for itself. E-Z Terms.  
Saws, Jointers, Sanders, Shapers, Band & Jig Saws  
Send 10c for Catalog and BOICE-CRANE CO. Metal Spinning Book Dept. 358, Toledo, O.

## DIESELECTRIC PLANTS

Electric Starting—Remote Control  
Make electricity the Diesel way for less than one cent per kilowatt. 110 volt A. C. or D. C. for direct lighting or 32 volt for battery charging. Saves 75%. Easily installed—occupies small space. Larger plants available.  
**WITTE ENGINE WORKS**  
5225 Oakland Ave., KANSAS CITY, MO.

## HANDEE

Tool of 1001 Uses  
A Whole Shop Full of Tools in One

For work on all metals, alloys, bone, resins, plastics, glass, stone, wood, etc. Uses 200 different accessories to grind, drill, cut, carve, sand, saw, engrave, sharpen, clean, polish, etc. Saves hours of tedious hand work. Plugs in any socket AC or DC, 110 volts.

**STANDARD MODEL**  
A sturdy little helpmate. Weighs 1 pound, 13,000 r.p.m. \$10.75 post-paid, 3 Accessories Free.

**DE LUXE MODEL**  
Fastest, most powerful tool of its type and weight, 12 ounces. 25,000 r.p.m. \$18.50 post-paid, 6 Accessories Free.

**GET A DEMONSTRATION**  
at your Hardware, Department or Tool Dealer or order either Model on 10-Days, Money-Back Trial. Catalog Free.

**CRAFTSMAN'S PROJECT BOOK**  
Easy working plans for making many interesting and unusual projects, 25c stamps or coin.  
Chicago Wheel & Mfg. Co., 1101 W. Monroe St., Dept. S, Chicago, Ill.

☐ Send Catalog ☐ De Luxe Model  
☐ \$10.75 Model ☐ Project Book ☐ Send C.O.D. PS-5  
Name.....  
Address.....

## Highways of the Future

(Continued from page 29)

junction," your guide continues, "your television set picks up the junction transmitter. All you have to do is glance at the viewing screen to find out where the crossroads will take you and how far it is to the next turn-off. And in case you get confused somehow, it's simply a matter of throwing that switch lever to put you in two-way radio communication with highway-patrol headquarters. They'll tell you where you are, how far it is in hours and minutes to your destination, and where to make the correct turn off the highway."

IN CONGESTED areas, you find out, highways are built on elevated structures over railroad lines. The top deck is reserved for private cars, while buses run on a lower level, and streamline trains race along on the tracks beneath. Train passengers transfer at metropolitan terminals to bus platforms for transportation to local stations in city suburbs and villages.

Traffic experts realize that a super-highway similar to the one just described must eventually be constructed—not only to handle an ever-increasing volume of vehicular traffic, but also to end the highway slaughter that in the last fifteen years has taken almost twice as many lives as the total lost in all the wars the United States has fought since the founding of the Republic. Accident statistics show that in many cases the driver is at fault, but the great majority of crashes can be traced ultimately to the roads over which we drive. Better, safer highways are a vital necessity, and extensive road-development programs, now being pushed by state as well as Federal authorities, may lead toward the high-speed superhighways of the future.

Already the State of Pennsylvania is pointing the way by authorizing the construction of what has been called the greatest road engineering project ever undertaken in the United States—a 164-mile, \$80,000,000 toll boulevard stretching through the Allegheny Mountains from Harrisburg to Pittsburgh.

THE proposed route will follow a \$10,000,000 railroad right of way, hacked out of the forests in the 1880's, and on which not one length of track has ever been laid. Built during a bitter feud between rival railroad interests, and abandoned after they concluded a truce, the unused roadbed runs through nine rock tunnels along its route for a total tunnel length of more than seven miles.

Engineers' reports indicate the startling advantages the toll road will have over present traffic routes through the mountains and suggest some of the features that may be expected in future superhighways. From Harrisburg west to Pittsburgh, cars now have to climb nine-percent grades for a total of 13,880 feet. Over the new boulevard, cars will ascend a total of only

(Continued on page 119)



## Highways of the Future

(Continued from page 118)

3,940 feet up grades that never exceed three percent. The route will eliminate four railroad and twenty-six highway grade crossings. Three quarters of its length will be entirely free from curves. On one straightaway, motorists will drive for forty miles without meeting a single bend in the road.

ULTIMATELY, the Pennsylvania toll road may serve as one link in the transcontinental chain of highways proposed by Senator Bulkley and now being studied by a committee. This whole Federal network would also operate under a toll system, scaled to the rate of about one tenth of a cent a passenger mile, in addition to a flat fee of twenty-five cents for each car entering the highway. Thus you would pay a quarter to get on the boulevard at New York and ninety cents to drive the 900 miles to Chicago, if you were alone in the car.

Federal police would man the toll gates and patrol the road. Since every car would be required to stop at toll stations, authorities could bar intoxicated drivers, check licenses, halt automobiles considered unsafe to drive, and enforce uniform traffic regulations—a procedure that might result in one nationwide code of traffic laws and regulations that would apply in every state in the Union.

These road-building developments indicate that the superhighway of the future is definitely on the way. No one can predict exactly what it will be like, but experts are confident that a modern Rip Van Winkle would wake up twenty years from now rubbing his eyes in amazement at the sight of streamline cars racing along broad, divided highways of concrete with a speed and a margin of safety far beyond his wildest dreams.

## POPULAR SCIENCE Question Bee

SEE how you made out in the Question Bee on page 62. In the list below, the letter alongside each number indicates the correct answer to the corresponding question. Check your own answers with these and give yourself four points for each one you had right. A total score of 80 to 92 is good, and 92 to 100 is excellent.

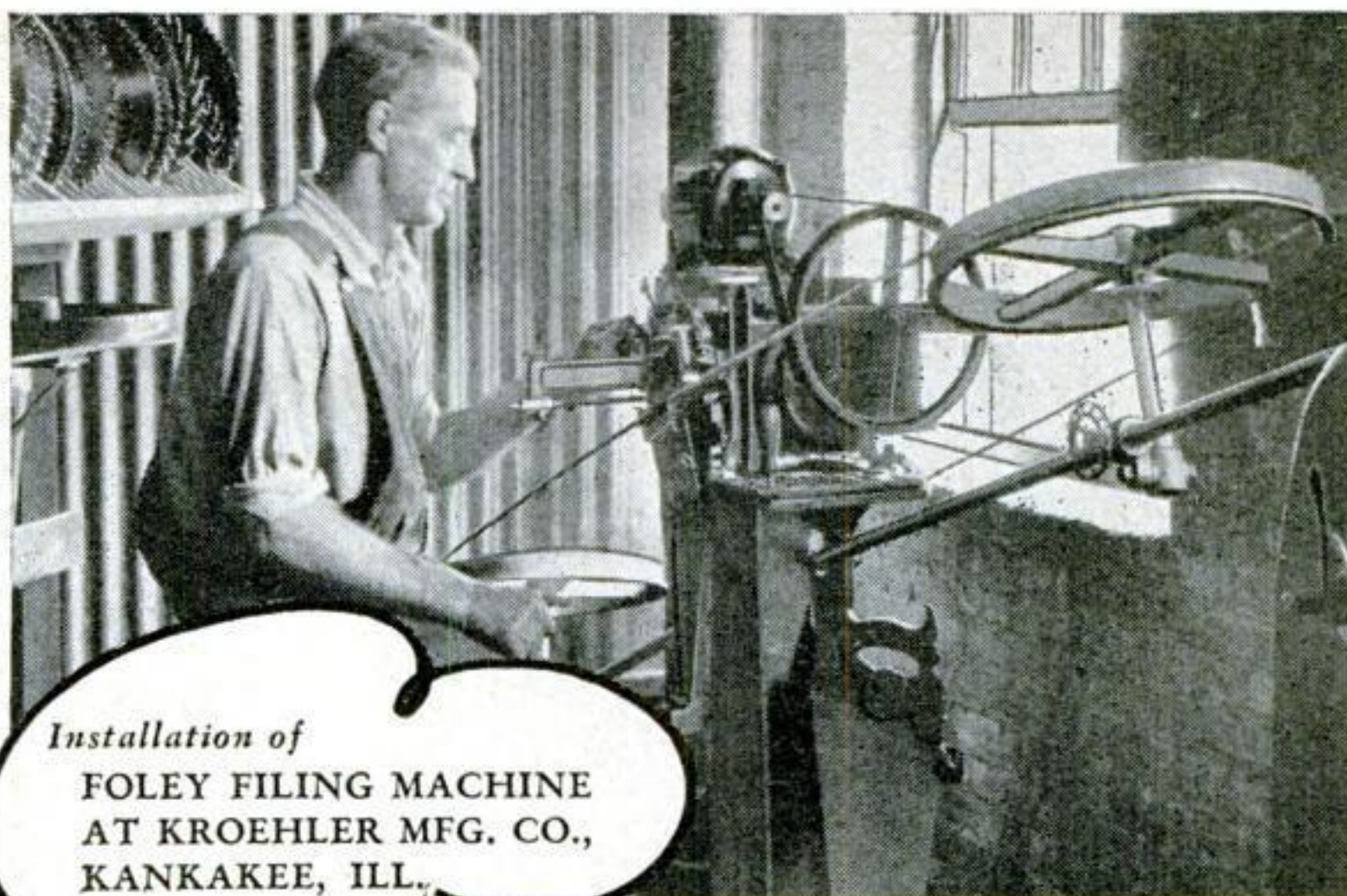
### QUESTIONS

- |      |       |       |       |       |
|------|-------|-------|-------|-------|
| 1. c | 6. b  | 11. b | 16. a | 21. c |
| 2. b | 7. c  | 12. c | 17. b | 22. c |
| 3. c | 8. b  | 13. b | 18. b | 23. d |
| 4. d | 9. d  | 14. b | 19. c | 24. a |
| 5. c | 10. d | 15. c | 20. c | 25. b |

### PICTURES

- |                      |                   |
|----------------------|-------------------|
| 1. spectroscope      | 5. radiometer     |
| 2. optical bench     | 6. galvanometer   |
| 3. Wimshurst machine | 7. wet cell       |
| 4. tuning fork       | 8. dipping needle |
|                      | 9. electroscope   |

## FOLEY SAW FILING MACHINES



Installation of  
FOLEY FILING MACHINE  
AT KROEHLER MFG. CO.,  
KANKAKEE, ILL.

## USE NICHOLSON FILES

The Foley Manufacturing Company, a leading maker of saw filing machines, has installations in thousands of shops throughout the United States.

The Foley Co. selects Nicholson Files as standard equipment for its machines. For the efficiency of the machine is transmitted through the file; and Foley has found from experience that Nicholson Files are always fast cutting, durable, uniform in quality and ideally designed for saw filing.

You, too, will find Nicholson Files the best you can buy—for home or industrial use. You are sure of "twelve perfect files in every dozen" when you specify the Nicholson Brand. At hardware stores and supply dealers'. Nicholson File Company, Providence, R. I., U. S. A.

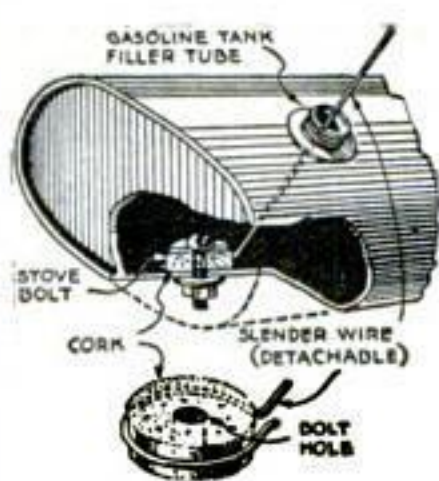


## A FILE FOR EVERY PURPOSE

When Writing Advertisers  
Please Mention POPULAR SCIENCE

## Be Your Own Auto Trouble Shooter

NEW SIMPLE HANDBOOK MAKES IT EASY



A reduced drawing from AUTO KINKS showing how to repair hole in gasoline tank without soldering. Complete explanation in book.

Now you can cut down monthly repair bills and keep your car in A-1 condition by doing yourself many easy tasks completely explained in this brand new manual.

Anyone can follow the non-technical language in AUTO KINKS fully illustrated with drawings and simple diagrams, and find out just what to do no matter what goes wrong—how to make temporary or permanent repairs to the motor, carburetor, fuel line, ignition, lights, starter, radiator, chassis, running gear, body, fender, top, and even the garage.

AUTO KINKS is a complete service manual which will save you many times its cost. Besides cutting your repair bills, you will get a lot of fun out of doing these simple jobs yourself. 192 pages, full strong cloth binding, pictures on every page, only \$1.00 C.O.D. plus a few cents postage.

POPULAR SCIENCE MONTHLY—Dept. 58  
353 Fourth Ave., New York, N. Y.

Send me AUTO KINKS. I agree to pay the postman \$1.00 plus a few cents postage when the book arrives. If I am not entirely satisfied with the book, I will return it to you within 5 days of receipt and you will refund my money in full.

Name .....

Address .....

City..... State.....

## Heavy, All-Steel KRW MECHANIC'S BENCH



**\$15.00**  
F. O. B. FACTORY

Terms, cash with order

**3 1/2" Machinist's Vise—\$9.30 extra**

Here's a value that every shop, garage, factory and home-workshop owner will appreciate. An extra-sturdy, heavy-gauge steel "Individual" Bench, 29 1/4 x 42", that makes for greater shop efficiency. Much handier than old-style wall type benches. Attractive red or gray enamel finish. Shipped K D (142 lbs.) from factory, Jenkintown, Pa.

Other Benches up to 10' length, with or without steel Drawers. All fully guaranteed. Send orders and inquiries to

**K. R. WILSON, 9 LOCK ST., BUFFALO, N. Y.**

Builders of Shop Equipment For Ford Dealers Since 1916  
West Coast: 722 Mateo St., Los Angeles. Export Office: 90 West St., New York





Write today for ALLIED's big Spring Catalog—just off the press! 164 pages packed with everything **NEW** in Radio. 56 sensational new "KNIGHT" Radios, including Push-Button Tuning models at new low prices; latest Auto Radios; Phono-Radio Combinations; 6 volt-110 volt Farm Radios; sets for AC-DC, 6 volt, 2 volt and 32 volt operation at unequalled low prices . . . *Set-Builders' Kits* of all types from 1 to 14 tubes . . . *Amateur Gear* in all leading lines . . . Amazing new *Sound Systems* for every purpose, from 10 to 70 watts . . . *Test Equipment* for all servicing needs. And more than 12,000 parts—books, tools, etc. Everything you need in one complete book. Lowest prices, fastest service. **SEND COUPON** for Free new Catalog.

**FREE PARTS LISTS**—Write for Free parts lists for any kit described in this or in any other magazine.

## ALLIED RADIO CORP.

833 W. Jackson Blvd.  
Chicago, Illinois

Dept. 7-E-8

☐ Send me your new Spring and Summer Catalog—Free.

Name.....

Address.....

Always mention **POPULAR SCIENCE MONTHLY** when answering advertisements in this magazine.

## Super-X and Xpert Give You Everything!



Western Super-X or Xpert .22's give you every desirable feature, at no extra cost!... In Super-X: 50% more power, 26% higher speed, long range, accuracy, and bullets that *mushroom*! In Xpert, for all-around shooting: a new high standard of accuracy! Both are *smokeless* and *non-corrosive*.

**FREE HANDBOOK!**



Western Cartridge Company,  
Dept. E-16, East Alton, Ill.

Send, **FREE**, the 72-page Western Ammunition Handbook. A complete shooting guide. Tells all about all Western cartridges and shot shells.

Name.....

Address.....

Post Office..... State.....

## Hospital on Wheels Aids Firemen

(Continued from page 39)



Tubular metal splints, another new feature of the fire ambulance's equipment, being applied to a broken arm of one of the smoke eaters

and cold running water. Below, enameled drawers are packed with surgical instruments and medical supplies. There are clippers and shears, tweezers and forceps, magnifying spectacles for examining eyes, and tourniquets of a dozen varieties. Ranged along the table beside the sink are a row of clips, each holding a bottle of ointment or oil for use in treating burns. They can be snatched from the clips in an instant when an emergency arises.

Virtually everything the new ambulance contains has been specially designed to conserve space. Blood-pressure gauges and other aids for the surgeon have been made in the most compact possible form. Midget sterilizers can be plugged into a wall socket above the sink to provide boiling water. When the fire surgeon leaps into the new ambulance at the beginning of a run, he has to be prepared for anything. He never knows what emergencies lie ahead.

**A** FEW weeks ago, a large rubber-storage plant burned on the outskirts of Brooklyn. Explosion after explosion showered the apparatus and the men with burning rubber. Then, in the midst of treating burns, the surgeon found far more serious cases on his hands. One of the great hoses got out of control. These mighty tubes sometimes pour a ton or more of water a minute from the nozzle. The kick of the high-pressure stream shoves the nozzle to the rear. To keep it in place, the firemen have to tug forward with all their might. In this instance, the hose had broken from their grasp and was causing a lot of trouble.

Writhing like a giant snake, it lashed the heavy metal nozzle back and forth. Four firemen were bowled over like tenpins. One had his skull fractured. Another was struck in the stomach and sent to the hospital for two months. When the new rolling hospital was de-

signed, experts thought ahead and equipped it to meet any emergency which might arise.

An instance of the care with which the interior was planned is the small electric fan that keeps the air circulating within the ambulance. The blades of the fan are made of rubber. Thus, if a lurch or a sudden stop throws the surgeon into its blades, they bend back and do not injure him as they would if they were made of metal.

**B**Y LIFTING tubular frames into place, the interior of the ambulance can be turned into a miniature ward with two comfortable cots for seriously injured men. During a run, if the doctor needs help, as in the case of a bad hemorrhage or of a patient going violently insane, he can signal the driver by pressing a buzzer button. At such a signal, the car would immediately be brought to a stop and the driver would dash to the back of the ambulance to give needed assistance to the physician.

Under the cots are stored the extra tanks of oxygen for the resuscitating apparatus. Firemen who are overcome by smoke often have their jaws clenched so that special mechanisms are needed to open them and insert the oxygen tube. In the old days, in such an emergency the injured man had a tooth knocked out with a hammer and chisel to provide space for inserting the tube. Now, a simple screw device pries the clenched teeth apart. The small end is pushed between the teeth and the device is then turned in the manner of a corkscrew to force it inward and open the clenched jaws. In the hands of a skilled surgeon the operation takes but a few minutes.

**A**NOTHER recent innovation is the use of metal-tube splints for broken arms and legs. Several are carried in the blanket compartment which is reached through a door on the side of the ambulance. But the most important recent advance is a rigid stretcher. It has folding arms at the back which lock in place, holding it firm, and a trio of wide straps which buckle over the patient and prevent him from rolling off even when the stretcher is tilted sidewise or upside down. On such a litter, injured persons can be brought out of burning buildings through narrow openings and can be lowered vertically to the ground from upper stories. It was developed by Capt. Joseph F. Dunleavy, the man in charge of the new ambulance, under the direction of Commissioner John J. McElligott.

More than 1,000 times a year, the new streamline, roving hospital will carry aid to the firemen of America's biggest city. Compact and complete, its equipment will be instrumental in saving the lives of men whose business it is to save the lives of others.



*The Only*  
**425-POWER  
MICROSCOPE**  
*at this Low Price*



● Revealed to your startled eyes, through this 425-power Wollensak Microscope, are thousands of Nature's hidden life-forms—some of rare, gorgeous beauty, some monstrous and horrid. And revealed with the fine sharp detail that makes Microscopy a lasting joy. Magnifies from 100 to 425 diameters. A lifetime of use for \$20. Also 150-power, \$14.50. Stores or direct, post-paid (or C. O. D.)

**\$20**

Write for **FREE BOOK**

Wollensak Optical Co., 802 Hudson Ave., Rochester, N. Y.

**WOLLENSAK**

**WORLD'S GREATEST all around  
ELECTRIC TOOL**

**DRILLS—GRINDS—SHARPENS  
SANDS—SAWS—POLISHES, etc.**

The new WHIZ ELECTRIC TOOL is the handiest, most useful power tool ever made. Not a delicate instrument but a real rugged tool, equally effective for both power and precision work. Drills through 1/2 inch iron plate in 42 seconds or engraves intricate designs on jewelry. Handles any material: Metals—Woods—Alloys—Plastics—Glass—Steel—etc. Saves time. Eliminates tedious labor. Plug into any socket AC or DC, 110 volts. Chuck 1/2 capacity. Ball bearing thrust. Powerful, triple-gear motor. Worth its weight in gold, to a mechanic or handy man.

**STANDARD MODEL** with Normal Speed (uses 50 different accessories, instantly interchangeable) only \$6.95.

**Accessory outfit** (Value \$2) includes set of drills, mounted 1 1/2" grinder, sanding discs, cutting wheels, mounted brush, polishing wheel, etc. **FREE** with each outfit ordered.

**FREE** NOW. We pay postage on all shipments. Will send C. O. D. if desired. **10 DAY TRIAL—MONEY BACK GUARANTEE.**

Special "2-SPEED" MODEL combines Normal Speed and High Speed in one outfit (uses 200 accessories) only \$8.95 complete, with above accessories and carving bur **FREE**.

**PARAMOUNT PROD. CO., Dept. 5-C, 48 W. 48th St., New York**

**60 POWER TELESCOPE \$2.19**  
**VARIABLE EYEPIECE 20X-40X-60X**  
**NEW!** Three telescopes in one 3 different magnifications. 20 power for ultra-bright images with 40 & 60 power for extra long range. Guaranteed to bring distant objects, people, sports events, ships, moon, stars, etc., 60 times, as close.

Most powerful made for anywhere near the money. Closes to less than a foot in length. Multiple lens system. 30 mm. objective in heavy brass mount. Directions included for using as a compound 4 lens microscope. American made. We pay the postage. Only \$2.19. Address Dept. 65.

**BROWNSCOPE CO., 5 W. 27th ST., NEW YORK**

**HEAVY STEEL  
SHOWER BATH**

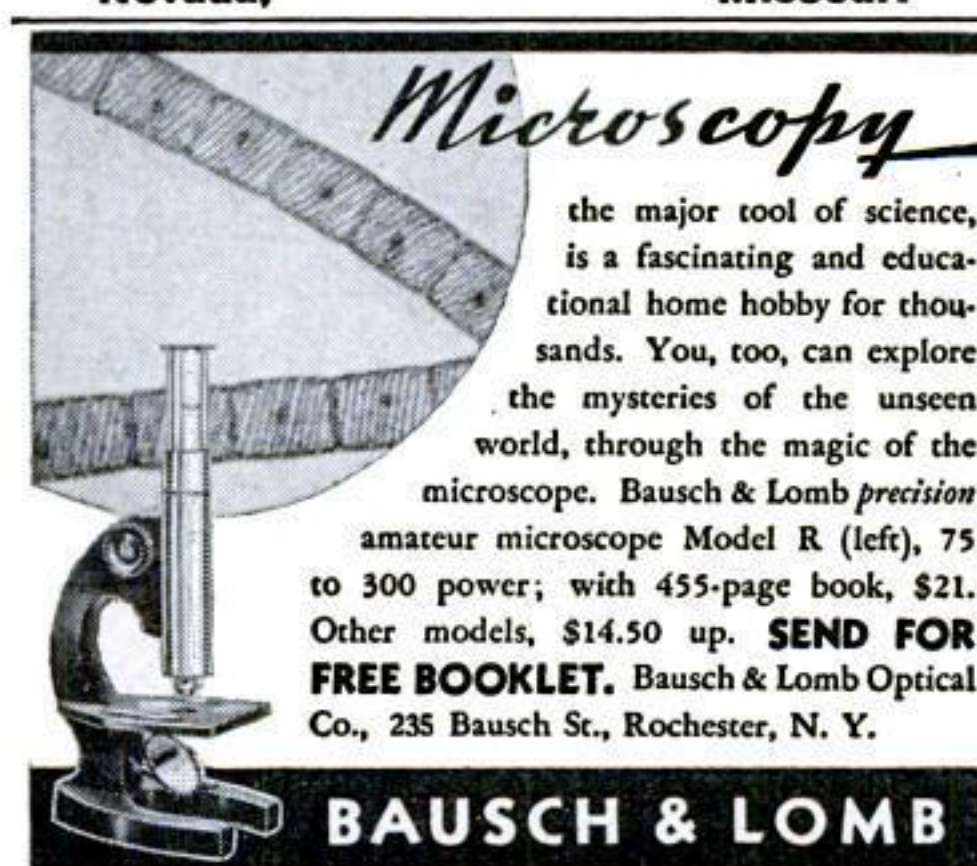
30"x30"x76". Beautifully Enameled white inside, green outside, complete with curtain rod, adjustable self cleaning shower head, hot and cold water faucets, soap dish, drain in floor all heavily chromium plated and polished, ready to set up; \$26.50 check or money order. Free booklet on request. Address

**NORMAN SHOWERS**  
Nevada, Missouri

**Microscopy**

the major tool of science, is a fascinating and educational home hobby for thousands. You, too, can explore the mysteries of the unseen world, through the magic of the microscope. Bausch & Lomb precision amateur microscope Model R (left), 75 to 300 power; with 455-page book, \$21. Other models, \$14.50 up. **SEND FOR FREE BOOKLET.** Bausch & Lomb Optical Co., 235 Bausch St., Rochester, N. Y.

**BAUSCH & LOMB**



## Slicing Specimens for Your Microscope

(Continued from page 89)

micrometer graduated in millimeters could be used, so that readings in microns would be easy; but it happens that these inexpensive micrometers are graduated in the English system. Around the edge of the thimble are twenty-five divisions, every fifth one numbered. Each of these divisions represents 1/1000 in., or 25.4 microns. It is easy to estimate fractions of a division, such as 1/2 or 1/3, when feeding the specimen.

THE table over which the knife slides is simply a rigid metal disk fitted to the upper end of the microtome body tube. In the instrument shown, this table was turned from an old carpet-sweeper pulley, and is made of some tin or lead-base alloy. It is attached to the body tube by means of threads and anchored with solder. A better arrangement is to employ a brass disk securely soldered to the tube. File, turn, or grind the surface of the disk and the end of the body tube at its center, to make them perfectly flat and even. If the end of the object holder projects above this flat surface when the micrometer feed is turned upward as far as the bolt in the side slot will allow, remove the holder and shorten it by removing some metal from the upper end. The knife blade should clear this end by a good fraction of a millimeter.

The coil spring (or a rubber band) extending between the object-holder bolt and one at the lower end of the body tube serves to keep the micrometer spindle and the bottom of the object holder in contact, which results in even feeding and uniform thickness of sections.

Specimens that are fairly rigid, such as twigs and stems, can be clamped in the object tube merely by screwing the clamping bolt against them. Softer specimens would be penetrated by the bolt, and not held rigidly. For such materials, make a rectangular sleeve or jaw, slightly curved, that will drop into the well of the object holder, between the object and side where the clamping bolt enters. The end of the bolt presses against this sleeve, and exerts uniform pressure along the length of the well.

LATER you will want to use the microtome to cut paraffin sections. That is, the object to be sectioned will be embedded in a small block of paraffin, which is fed past the knife so that paraffin and object are sliced at the same time. To hold such paraffin blocks, make a fitting that will drop into the well of the sliding object holder. The one shown was made from a machine bolt. A flat place was filed in the threaded portion to receive the end of the clamping bolt. The head was split with a hack saw to reduce it to a thickness of about 3 mm., and turned to a diameter equal to that of the outside of

(Continued on page 122)

## Treet Topics



-AND THEY'LL LOOK LIKE THIS ~



-AND YOUR BANKROLL WILL LOOK LIKE THIS ~



IF YOU DO THIS:



-AND TREET YOURSELF TO A PACK OF PERFECT SHAVES!



**4 FOR 10¢**  
**BLADES**  
Single-Edge  
**FOR GEM AND EVER-READY RAZORS**  
Treet Safety Razor Corporation, Newark, New Jersey





There's **NO DOUBT**  
ABOUT IT

THERE'S NOTHING  
QUITE LIKE

**Alka-Seltzer**

• Once you try Alka-Seltzer and experience its remarkable TWO-FOLD relief you will know why millions of folks say "there is nothing quite like Alka-Seltzer".

• The next time you are troubled with a Headache, Sour Stomach, Acid Indigestion, Cold or that miserable "Morning After" feeling, just drop an Alka-Seltzer Tablet into a glass of water—watch it bubble up and dissolve—then drink the pleasant tasting sparkling solution.

• Its analgesic properties go to work immediately to relieve the pain,—but remember, Alka-Seltzer is more than a mere pain reliever because its alkalizing agents also help to correct the excess acid condition so often associated with many of our common ailments.

At All Druggists—30¢ and 60¢ Pkgs.



**HUTHER SAWS**

THE ORIGINAL  
HUTHER DADO  
HEAD



DADO HEAD

**SMOOTH CUTS  
RIP OR CROSSCUT**

Smooth cutting saws for cross cut, rip or mitre.

They are made in a variety of teeth, but the No. 1 combination tooth cuts equally well rip or cross cut. Does beautiful work.

Write for booklet on directions for filing circular saws and groovers. Price 8" Hollow Ground Saw \$5.44.

**HUTHER BROS. SAW MFG. CO.**  
1290 UNIVERSITY AVE. ROCHESTER, N. Y.



MITRE SAW

## Slicing Specimens for Your Microscope

(Continued from page 121)

the object holder. The face, or upper surface when the fitting is in place, was grooved with a file, to make the paraffin stick better. In use, the holder is warmed and pressed in contact with the paraffin block, which is then trimmed flush with its edges. You can, instead of making such a fitting, fashion a length of cylindrical rod, drilling and tapping it for the bolt entering through the side slot. This rod takes the place of the hollow object holder.

THE microtome at this stage is complete, if you want only a hand-held instrument. But for a few cents and a few minutes more, you can make it fasten rigidly to a table. Obtain a small C clamp of a type similar to that shown, and file or saw the back edge of the frame until it is flat enough to rest firmly against the side of the microtome body tube. Drill two holes through the frame to receive short 6-32 machine bolts, which enter threaded holes in the tube. The sliding handle in the clamp illustrated was bent at right angles, to reduce its length so it would clear the micrometer thimble.

Much of the success in sectioning depends upon the knife used for cutting. Special microtome knives are obtainable, but costly. An old-fashioned, straight-back razor, if sharp, will do nicely; or you can buy, for a little over three dollars, a special sectioning razor. This is similar to the ordinary razor, but has a straight edge and one side that is flat. Cheapest of all, and capable of very accurate results, are ordinary safety-razor blades. These should be clamped in a holder that will keep them straight and rigid, or the cutting edge will have a tendency to bow down as it passes over the hole in the center of the microtome table. Some types of paint scrapers which employ razor blades can be used.

It is a good idea to select the best blades out of a given assortment, by examining the edges with your microscope for sharpness and uniformity.

Now that your microtome is complete, you can try it out on a few easily obtained specimens. Some materials can be cut directly without special preparation, others are best sectioned after treatment to harden or soften them, or after they have been surrounded by some supporting material.

PERHAPS the best objects to start with, in acquiring skill with your newly made microtome, are stems and roots of plants. By cutting sections in various directions—cross sections, longitudinal sections, and so forth—you can learn much about plant structure. Cross sections are generally the most interesting, and make particularly beautiful objects when stained with methylene blue, eosin, and other dyes.

When sectioning hard, woody stems,  
(Continued on page 123)

## Earn Wood-working \$\$ IN YOUR SPARE TIME!



Learn how you can build up a profitable spare or full-time business in your own home. This new book "How to Make Money in Woodworking" is crammed with practical tested ideas, plans, and suggestions. Tells you exactly what to make, how to make it and how to sell it. Describes plans that have worked for others. Woodworking, the new way, is light, pleasant and profitable. Send only 25¢ and complete book will be mailed postpaid. Satisfaction guaranteed or money refunded. Write to Dept. B538.

**Delta Mfg Co.** 500 E. VIENNA AVE.  
MILWAUKEE, WIS.

## Handicraft

Materials, caning chair frames, basketry—reed, raffia, grass, rush, fibre. Leathercraft. Jute and warp.

Send 10¢ for Catalog. Instructions free  
**AMERICAN REEDCRAFT CORPORATION**  
Dept. S, 130 Beekman Street, New York City

## WOODSTOCK TYPEWRITERS

**NEW TUG BOAT MODEL by Boucher**  
COMPLETE KIT WITH CARVED HULL  
SEND 25¢ IN COIN OR STAMPS FOR 1938 64 PAGE ILLUSTRATED BOOK—Scale Models of FAMOUS SHIPS.  
SIZE 12 1/2" LONG \$7.50  
1/8" TO FOOT SCALE  
NEW KITS NEW LOW PRICES

**BOUCHER** 126 LAFAYETTE STREET NEW YORK



## Wonders Through The MICROSCOPE

A new book which tells you all about MICROSCOPY. Turn an inexpensive microscope on hundreds of specimens within a stone's throw of your front door and you step off into a new world of wonders. Complete Manual for amateurs. How to use equipment, secure and preserve specimens, take photomicrographs, etc. Numerous illustrations. Full cloth bound \$1.00.

**POPULAR SCIENCE MONTHLY Dept. 58**  
353 Fourth Ave. New York, N. Y.

## "THE NEON LIGHT sets you RIGHT" ★TEST-O-LITE

At Electrical Stores or \$1.50 Postpaid  
Handiest electrical tester made; quickly locates trouble in electric circuits, fuses, cut-outs, motors, radios, etc. Has 1,001 uses for electricians or home. Tests any voltage 110 to 550; tells A. C. from D. C. Excels ordinary clumsy test bulb. Fountain-pen size; with pocket clip. Lifetime guarantee.  
**L. S. BRACH MFG. CORP.**  
57 Dickerson St. Newark, N. J.

## Science Says Many are Unnecessarily BALD



**Simple Vacuum Helmet  
Creating a Sensation**

Your falling hair or baldness may be unnecessary. Many cases of baldness are said to be caused by deficient blood supply to the hair roots. If your case is like that, there is hope for a full head of hair. Science's newest invention—the vacuum helmet—draws rich, nourishing blood to dormant hair roots with very first treatment. New development—the Hydro-Vac Machine, runs on your water faucet. Embodies same principle as machines costing \$150.00. Yet so inexpensive anyone can now afford to use it at home. Money back, cheerfully, if it doesn't grow hair on your head. Send name, quick, for complete confidential information, prices, terms, guarantee and FREE Trial Offer. Address Hydro-Vac, Dept. 135, Walnut Bldg., Des Moines, Iowa.



# WORMS

## KILL MANY DOGS

Worms may cause fits and convulsions, often with fatal results. Take no chances—worm your puppy or dog with Glover's Worm Medicines. In capsule form for Round Worms (Ascarids), Hook Worms and Tape Worms. Also Liquid Vermifuge for Round Worms (Ascarids).



**The New GLOVER'S Double Action CAPSULES**

An effective combination of medicines to expel both Round Worms (Ascarids) and Hook Worms in puppies and dogs.

Write for new FREE DOG BOOK—address

# GLOVER'S

Dept S, 462 Fourth Avenue, New York City

## BIG MONEY

### ASSEMBLING NEW BOAT

In a Few Days At Home

**\$6 PADDLE GIVEN**  
with your CK-Ki-Yak—if you hurry!

Make big money on each 20 lb. Mead Ki-Yak you easily assemble at home from complete cut-to-fit kit at amazing Low Factory Price! Portable, Seaworthy, Fast! 3 Ki-Yak sizes for paddling or sailing—2 OUTBOARD Ki-YAK models for rowing, sailing, motor (up to 8 h.p.). Patented aluminum-ribbed construction guarantees successful, quick, beautiful job. RUSH 10c for illustrated folder and \$6 Paddle Gift Offer!

MEAD GLIDERS, 15 So. Market, Dept. D-58, CHICAGO, U.S.A.

## A CANDID CAMERA

For 10 days ON APPROVAL!

Speed . . . Action . . . Excitement

Catch it all with this mighty little Candid Camera! You won't believe it possible at this low price, so we want you to try it out at our risk! Take all the pictures you want, under any conditions. Test out the remarkable clarity of the lens . . . the accuracy of the view finder. Compare it in action with any of the cameras selling for \$10 or \$20. Then, if you do not think this is the most remarkable camera bargain you ever saw, it won't cost you a penny! Fully corrected Wollensak 50 M.M. lens. Speed shutter. Fixed focus makes it possible to get sharp pictures at all times. Telescopic finder. Tripod Socket. Uses economical 127 V.P. or agfa A-8 film in color or black and white. 16 pictures on a roll. Has compartment for extra roll of film. Enlarge clearly up to 8" x 10". ORDER NOW for special introductory Price of only \$3.98 Postpaid, C.O.D. if preferred plus postage.

Candid Camera Supply Co., 303 W. 42 St., Dept. 20, N.Y.

## SHIP MODEL FITTINGS

### Build the 4-mast Barque, California

Accurate detailed blue prints of this handsome, steel barque. Complete fittings and construction sets for steam trawler and other popular models including the "Hartford". Send 20c (coin) for new illustrated catalog. Illustrates hundreds of items, fittings and complete kits.

**A. J. FISHER**  
1002-2 Etowah Ave. Royal Oak, Mich.

## Decorative Decalcomania Transfers

Imported Designs of all Sizes and Types—Flowers, Figures, Marquetry, Birds, Juvenile, Borders, etc., for Furniture, Doors, Trays, Lamps, etc. Catalog with 800 illustrations in color sent for 25c. Deductible on first dollar purchase.

**L. C. WELLS**  
Dept. PS-85, 25 East 26th Street, New York

## Slicing Specimens for Your Microscope

(Continued from page 122)

or pieces of lumber (which are parts of larger stems), you usually can clamp them in the microtome without providing any surrounding material to support them. Softer stems have to be supported by some auxiliary material. There are various suitable materials for this form of simple embedding. Generally, cork is used for fairly rigid stems and similar objects. For the more delicate materials, you can use dry elder pith, pieces of raw carrot or potato, or in fact anything that will provide the necessary rigidity and at the same time can be cut easily.

**T**O MOUNT a stem so that it will be supported by, say, a cylinder of cork, trim the cork until it will enter the object holder of the microtome. Then split the cork cylinder in two along its axis, and with a sharp knife cut two small V notches so that, when the halves are put together, the notches will form a rectangular hole. The shortest diameter of this hole should be slightly less than that of the stem. Place the stem between the halves, like a "hot dog" in a bun, and clamp the sandwich in the microtome. Take two or three fairly heavy cuts to square up the end, and then make the sections, cutting them as thin as possible.

Instead of the V grooves in the halves of the embedding material, you can cut semicylindrical ones, if you like. Perhaps a small carving tool would be ideal for this. Still another way is to punch or drill a hole in the cylindrical plug without splitting it, and push the stem into this hole.

If you want sections of wood, it is best to cut them from the green stem rather than from seasoned wood. Cut the stems into short lengths, and soak them for several days in strong alcohol, to remove the resin. Then soak them a few more days in water, to dissolve out any gummy matter present. The stem should then be fairly easy to cut. If you want to section seasoned wood, split pieces to a size that will enter the microtome, and soak them for several days in water, or boil if necessary. Further treatment with alcohol and again with water, as in the case of green stems, usually will soften the wood still further.

**I**N CUTTING stems and the like, curling can be reduced or prevented by having the stems and the knife blade wet with water. The section will float up on the blade and lie flat. It can be washed off by dipping the blade in a jar of water, or it can be lifted off and transferred to a dish of water with a small camel's-hair brush. Treatment of the thinly sliced specimen after that may take any of various forms. For immediate inspection under your microscope, the stem section can be mounted in glycerin, or in a weak alcoholic solution.



## "POLISHING'S A CINCH with DU PONT POLISH"

Now you'll find it easier, quicker than ever to make your car mirror-bright. A little brisk rubbing with Du Pont No. 7 Polish, and your car sparkles like new. No. 7 Polish is made by Du Pont, world's largest maker of modern car finishes. That's your assurance it's right for the finish on your car. Try No. 7 today!



Sample for You! Send 6¢ to help cover mailing cost and you'll receive promptly a sample can of No. 7—enough to polish fenders and hood. (Offer good in U. S. only.) Write Du Pont, Dept. PS-1, Wilmington, Del.

## Always ask for DU PONT POLISH



# Thrilling NEW EVINRUDE "Ranger" ONLY \$47.50

A brand new Evinrude . . . amazingly light, handy and powerful. Weighs only 16 lbs., and cruises 3 hours on a single fill! Literally packed with big-value features including famed Hooded Power — Evinrude Co-Pilot — Underwater Silencing. Starts instantly! — spins into action with a flick of the starting cord. Costs less than 3¢ an hour to operate. Send for catalog!

## ELTO PAL only \$37.50

Elto PAL (built by Evinrude) weighs only 14 pounds, and drives boats at twice the speed of oars. Elto ACE, \$47.50 — the husky Handi-twin, only \$67.50. Each an outstanding value! Address EVINRUDE MOTORS, 5456 N. 27th St. Milwaukee. Prices F. O. B. Factory

FREE Catalogs! Write for 1938 Evinrude and Elto catalogs . . . Boat Directory and Boat-and-Motor Selector.



## EVINRUDE OUTBOARD MOTORS



## BE at Home ON STRANGE ROADS

With a Hull Auto Compass you never get confused on strange country roads or city streets. It always tells your direction of travel, saving you miles, money, worry and delays at a cost of only \$2.95 at your dealer. Two-piece model \$1.95. Write for circular.

Hull Mfg. Co., P. O. Box 246-E1, Warren, Ohio

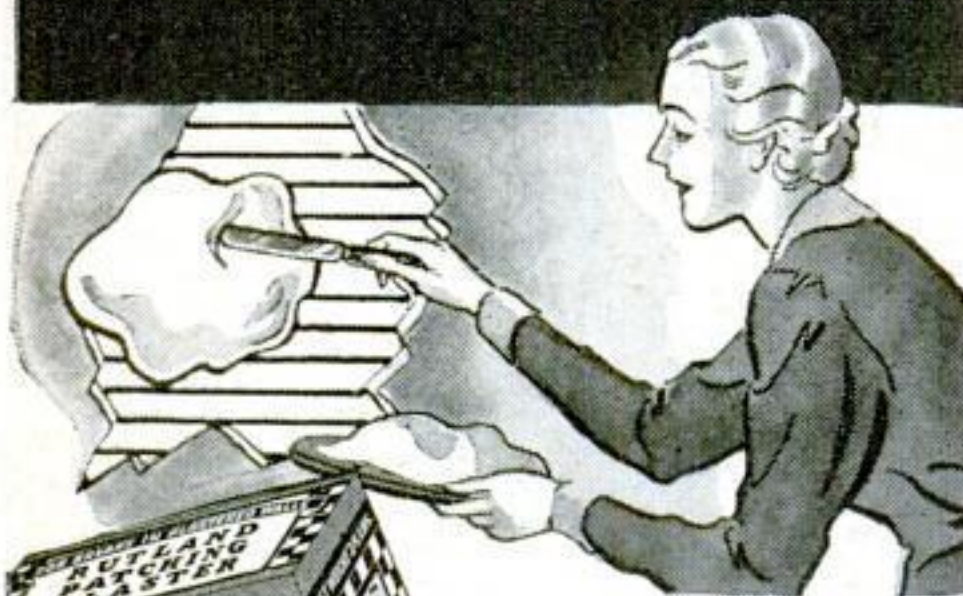


## MOVIE CAMERAS PROJECTORS 10¢ A DAY

Nationally Advertised! 10-Day Trial! Entertain with real movies of children, sporting events, trips, etc. Latest model Movie Cameras and Projectors, 8MM and 16MM sizes. For homes, business, churches, schools and clubs. All accessories. Satisfied Customers throughout the World. MONEY BACK 10-DAY TRIAL on all Cameras and Projectors. SMALL DOWN PAYMENT. Balance AS LOW AS 10¢ A DAY. FREE details, write: DON ELDER'S HOME MOVIES, 739 BOYLSTON ST., Dept. C-5, BOSTON, MASS.

# PATCH HOLES IN WALLS

EASILY AND PERMANENTLY



Rutland Patching Plaster makes a perfect patch as lasting as the wall itself — and anyone can use it.

# Wild Animals Are His Hobby

(Continued from page 45)

But to get back to the second step in the preparation of a mixed act. This is taking the animals into the arena, one at a time, and training them to obey simple commands—for example, to climb on a pedestal when the trainer cracks his whip and taps the top of the stand. There follows, as the third step, the coaching of the different animals in their special tricks. Thus, the leopard is taught to jump through a burning hoop; the lions to ride on a seesaw; the bear to balance itself steadily on a rolling ball.

THIS last trick, alone, may require two months of daily rehearsing. When anything moves under an animal, its instinctive impulse is to jump. The bear is taught to sit up on the stationary ball first. Then, by putting the sphere on increasingly steep inclines, it is trained to keep on top as the ball rolls along. The final step is "cuing" the animals so they know when to begin their particular tricks. When these signals are letter perfect, the beasts are ready to put on their mixed act in public.

While such acts are most likely to produce fireworks, many of Keller's arena thrills have come while he was working with only one or two animals.

A couple of years ago, for example, he was training Simba, a 170-pound mountain lion from Arizona, to leap twenty feet through hoops from one pedestal to another. Somehow, one of the guy wires that braced the second stand had become loose, and the pedestal swayed as the great cat struck it. Keller saw the cougar land all right, and turned his attention to a second animal on the other side of the ring. An instant later, the 170-pound Simba landed on top of him. Its great claws ripped the whole back out of the leather jacket he was wearing, and the impact knocked him flat.

When the mountain lion had felt the stand sway under it, it had instinctively leaped for the nearest object—which was Keller. It had landed on his back, just the same as it would have hit the trunk of a tree. Although it meant no harm, it gave Keller probably the biggest surprise of his animal-training life.

THIS cougar was one of the most intelligent creatures that Keller ever handled. Its eyes, he noted, were set unusually far apart. It came to him from a Government trapper in Arizona when it was about eight weeks old. As the only mountain lion ever to walk a tight rope, it attracted wide attention and traveled with one of the leading American circuses. Later, it toured the country advertising the motion picture "Sequoia."

At present, Keller is working up a spectacular "Albino Act." Five all-white animals will take part. He has a white deer, an albino porcupine, an

albino opossum, and two white squirrels. Up until a few days ago, he had a great snowy owl included among the performers. It escaped, however, while he was taking moving pictures of it in the open.

Probably the strangest story connected with Keller's back-yard menagerie is the tale of Lobo, the tame wolf. This animal arrived at Bloomsburg when it was a small puppy. It grew up to be as gentle as a collie. It used to accompany Keller on long hikes in the woods, roving through the underbrush and coming at a whistle from its master.

ONE winter, Lobo starred in a production of "Little Red Riding Hood" given at the college theater. It trotted out on the stage, a full-grown gray wolf, following a little girl who played the part of Red Riding Hood. Another time, its collar broke and it roamed about the campus for a quarter of an hour before it heard Keller's sharp whistle and came running to his side.

For three years, Lobo lived the life of a pet, sharing its cage with a pedigreed female police dog which became its mate. Then, a man in a neighboring town offered a high price for the female and Keller agreed to sell her. The wolf, watching through the wire of its cage, saw the stranger hand over the money and then, taking the leash, lead the police dog away. In an instant, all Lobo's trust in man disappeared. When Keller tried to feed it, it leaped clear across the cage at his throat. When he put a female wolf in the pen to take the place of the police dog, it tried to tear her to pieces. Finally, the animal became so violent, it had to be shot.

All told, Keller has had more than 100 animals and birds in his home menagerie. The only bird he has tried to train was Nina, a five-year-old golden eagle from Colorado. It took him about nine months to teach it to hunt like a falcon.

THE cost of food for his back-yard zoo runs to about five dollars a day. He has to buy twenty pounds of raw meat daily, the lion and two cougars consuming five pounds apiece.

But the hobby is paying for itself. Trained animals sell for several times as much as untrained ones. Keller can buy an African lion cub, for example, for about \$100. When it is trained, he can dispose of it for from \$250 to \$300. At the end of the season, he sells the best of his performers to dealers who supply circus and vaudeville men, here and abroad.

The saying, "Every day is circus day at Kellers," which you often hear in Bloomsburg, is doubly true. Not only is Keller providing an exciting show for onlookers, but, he says, he is having a circus himself in the pursuit of his unique and thrilling hobby.



# CHEMICALS

5c C. P. Grade—5c  
Generous Quantities

... and in glass containers—unconditionally guaranteed!

**FREE** big fully illustrated valuable catalog—a real 25c handbook. Equip a complete home or professional laboratory with chemicals, apparatus, microscopes and instruments at real bargain prices. Save money! Send 3c for postage. Get your copy NOW!

**KEMKIT SCIENTIFIC CORP.**  
397-A Bridge St. Brooklyn, New York

**NOW a DYNAMIC HEAVY DUTY INDUSTRIAL WELDER**

**WORKS OFF 110-Volt Light Socket.** This marvelous Dynamic Power Welder does the work of much higher priced types. It is RETAIL \$195. **WELDS** Cylinder Blocks, Bumpers, Fenders, Tanks, Farm Machinery, etc. Will also solder and braze on the lightest material. Works on iron, steel, tin, brass, copper and all other metals. Men without previous experience can make as much as \$5.00 on a one hour repair job. Go into business—Open a Welding Shop Now. **AGENTS**—Make big profits selling to garages, factories, janitors and machine shops. **WRITE** for 10-Day Trial Offer. **DYNAMIC WELDER COMPANY**  
2226-DL SILVERTON ROAD, CHICAGO, ILLINOIS

**MICROMETERS**  
Special \$11.95

Six piece set, in velvet lined leather case. Precision machined in one thousandths, up to 4" outside and 3 1/2" inside measurements. Easy to read, adjust and accurate—complete satisfaction. Buy now at bargain price. Shipped prepaid on receipt of remittance. On C. O. D. shipments, send deposit of \$2.00.

**CARSTON SALES CO., Dept. 205**  
5431 W. Harrison St. Chicago, U. S. A.

**The "BOUNTY'S LAUNCH"**

An exact replica of the boat used by Capt. Bligh in his famous voyage. A companion piece to all models of the BOUNTY. Scale 1/2" to the foot. **PRECISION SHAPED and FULLY HOLLOWED HULL**; all finished fittings, sails, spar material. **COMPLETE KIT \$4.50.** Send \$1.50 in coin or stamps for fully illustrated catalogue of fittings, plans and construction sets of this and many other famous ships.

**MARINE MODEL CO.**  
174 Worth St. Dept. P New York, N. Y.

**FREE!** **LABORATORY APPARATUS BIOLOGICAL SUPPLIES MICROSCOPES TELESCOPES CHEMICALS**

New complete 32 page catalog lists hundreds of items of interest to amateur and professional experimenters. Save Money—Buy Direct. Send now! It's FREE and crammed full of bargains and valuable information.

**J. H. WINN MFG. CO., Dept. 105, 124 W. 23 St., New York**

**EXPERIMENTERS**

**SPECTROSCOPE** for chemical analysis, showing countless lines of sun and ores, with chart to identify elements, and book of 120 experiments.....\$2.50  
**TELESCOPE** clearly showing moon craters.....\$1.00  
**STROBOSCOPE** with 110-volt motor, neon lamp, and book of 100 experiments and optical effects.....\$1.00  
**MAGIC ROD** glows in the dark in six colors.....\$1.00  
**ELECTRIC FUN!** Book of 200 stunts, 110 volts; describing arcs, motors, window displays, magic tricks, etc.....\$1.00  
**SPINTHARISCOPE!** See atoms explode.....\$2.00

**Cutting & Sons, 58 S St., Campbell, Calif.**

# CHEMICALS

Laboratory Apparatus and Glassware  
Send 3¢ for Catalog CP1

**BIOLOGICAL SUPPLY COMPANY**  
1176 Mt. Hope Ave. Rochester, N. Y.

**REAL MONEY** RENTING OR SELLING  
New RANGER SCOOTER

There's big money selling this new, marvelous improved RANGER SCOOTER to all stores needing quick, cheap delivery—or renting to riders! Good territory still open. Ranger Scooter is safe, sturdy—gets 120 miles to gallon at 30 m.p.h. **EASY TERMS FINANCED.** Act now! Write for Free folder, Special Low Agents' Prices.

**MEAD CYCLE CO.**  
Dept. ES-249 CHICAGO, U. S. A.

**WHAT CAN YOU DO WITH ONE INCH?**

This is written in one inch—the smallest advertisement accepted in this magazine. Small advertisements of one or two inches produce results of many times their cost for hundreds of companies or individuals who have novelties, scientific or mechanical equipment, tools, games, puzzles, etc., to sell, and for firms looking for agents. Inch advertisements like this cost \$38.50. They pay well because they are seen and read by 400,000 wide-awake men every month. Interested parties are invited to address the Advertising Department, Popular Science Monthly, 353 Fourth Ave., New York, N. Y.

## Color Chemistry

(Continued from page 91)

be agitated similarly with a stirring rod, but no cotton is placed in this solution.

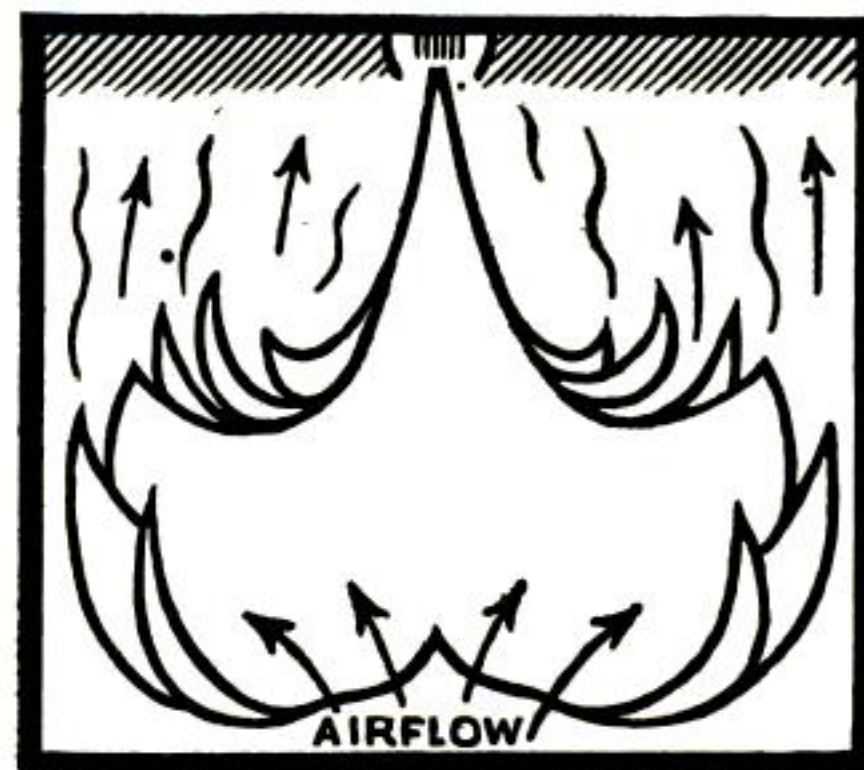
Now withdraw one cubic centimeter of liquid from each beaker, with a pipette, placing the samples in separate test tubes. Add fifteen cubic centimeters of water to each tube. Then bubble hydrogen sulphide gas through each sample of liquid for about five minutes. The solutions will both turn dark, because of the formation of lead sulphide. Place the two tubes in your colorimeter and look down through them. You will plainly observe that one of the solutions—the one in which you placed the cotton—is lighter than the other.

**BY** THE process of adsorption, which means the adhesion of molecules of a gas or a dissolved substance to a solid body, the cotton has removed some of the lead chemical, leaving less to react with the hydrogen sulphide gas and form lead sulphide. Although the amount of lead taken out of solution is small, the colorimeter should clearly reveal the phenomenon. If it does not, you have probably used so much of the lead chemical that the tubes are too deeply colored to show any difference in tint, and you should try the experiment again with a smaller quantity.

One way you can make the hydrogen sulphide gas is to dilute sulphuric or hydrochloric acid with four times its volume of water and add the acid, in a suitable vessel, to lumps of iron sulphide (ferrous sulphide). You will not have to purchase iron sulphide or an acid to generate hydrogen sulphide for this and other experiments, however, if you use the simple little generator shown in one of the accompanying pictures.

**T**HIS convenient source of hydrogen sulphide consists of a flask in which ordinary paraffin or candle wax is placed, together with some flowers of sulphur. Some glass wool or asbestos fibers can be added to facilitate the contact of these two materials, which supply respectively the hydrogen and the sulphur of which the gas is composed. Whenever the flask is heated, a good stream of hydrogen sulphide is obtained. As soon as it cools, the contents solidify and will not spill, so that the flask can be tipped on its side and placed in a drawer, if desired, for future use. The generator may be heated by a candle flame, an alcohol lamp, or the miniature electric heater shown—a cigarette lighter screwed into a 110-volt socket and operated directly from the house current. If the flask is of heat-resisting glass, the conventional wire screen between the vessel and the source of heat may be omitted. In the handy arrangement illustrated, the flask is clamped to a support and mounted with the heater on a wooden base, so that it is permanently set up and ready for service.

## How to Save Money on Fuel Bills



### More Heat From Less Oil

**T**HE General Electric Oil Furnace is different in appearance and different in operation from all other types of oil heating units. Even the basic principle behind it is different.

Oil is burned in a new and better way—by the exclusive G-E method of combustion.

There are two steps in the combustion process. First—the oil is "atomized", mixed with air, in a special chamber within the burner head. Then—as the air-oil mixture enters the combustion chamber and bursts into millions of tiny particles—additional air is introduced from below.

The result? Complete combustion! Every particle of the oil is burned—and burned without roar or soot or odor.

That's why the G-E Oil Furnace is so economical to own—and that's why so many owners are reporting savings of 25 to 50 percent on their fuel bills!

You ought to know all about this better, different G-E Oil Furnace. You ought to see it in operation. Only then can you appreciate fully the comfort it offers and the money it saves. Talk with your local G-E dealer, or write for free literature—General Electric Co., Air Conditioning Division 1145, Bloomfield, N. J.

## SHUNNED AT SCHOOL BECAUSE OF PIMPLES?

### Take steps to free your blood of skin-defiling poisons

Stop being the victim of ugly hickies. Don't be shunned and laughed at. Get right to the root of the trouble. It may be poisons in your blood.

Between the ages of 13 and 25, important glands are developing. These gland changes often upset your system. At the same time, waste poisons from the intestinal tract may collect in the blood stream... bubble out on your skin in disfiguring pimples.

You want to rid your blood of these skin-irritating poisons. Thousands have succeeded—just by eating Fleischmann's Yeast, 3 cakes a day. The millions of tiny, living plants in each cake help you keep these poisons out of your blood, give you clearer, smoother skin.

Many get splendid results in 30 days or less. Don't waste time and run the risk of permanently damaged skin. Start eating Fleischmann's Yeast today!





**The Most for your money!**

Quality does not **always** mean high cost—look at the new 1938 line of NEPTUNE Outboards! Priced from \$39.50 (1.2 H.P. Single) to \$164.50 (16 H.P. Master Twin) built to endure years of hard steady service - you'll find a motor of the exact type and size you require, at a price **lower** than you expected to pay.

Combination air and water cooling, automotive float-feed carburetor, Monel metal shafts, under-water silencing, high tension fly-wheel magneto, gasoline control in steering handle. Take a look at the new lightweight 1.2 H.P. Single and the smooth running 9 H.P. Alternale-Fire Twin!

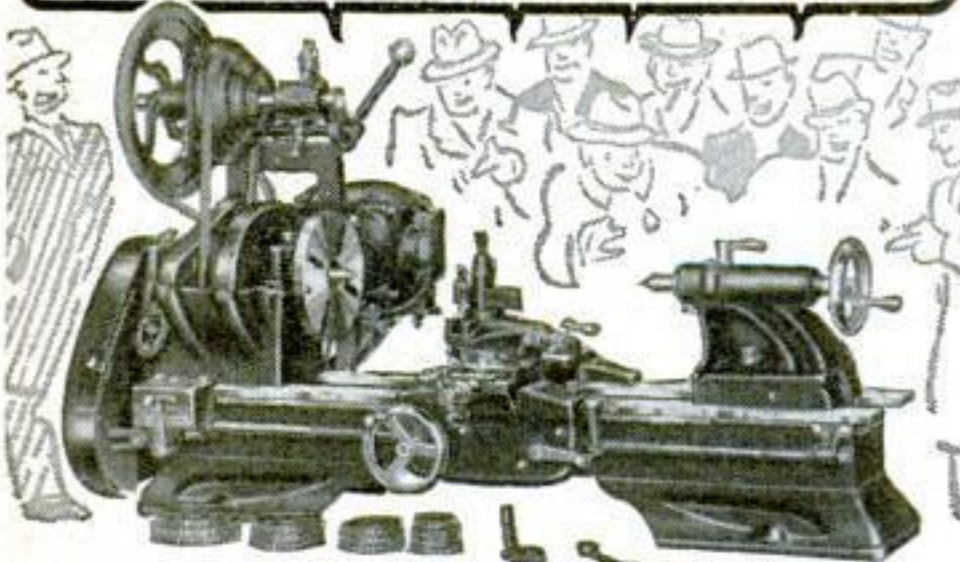
**NEPTUNE Motors**

**MUNCIE GEAR WORKS, Inc.**  
Muncie, Indiana

**FREE** Send for illustrated folder giving details and prices.

**BUILT FOR SALT WATER AS WELL AS FRESH WATER**

## ...I'M GOING TO HAVE AN ATLAS IN MY SHOP



All who see the Atlas precision lathes and other shop equipment talk about the power, versatility, and extra features of these modern machine tools. The 10" back-geared model illustrated is \$98.50 complete with countershaft, V-belt drive, change gears, and many other special features.

### New DeLuxe SMALL LATHE \$59.50—\$64.50



Machinists, model makers, jewelers, home craftsmen are most enthusiastic about this sensational new lathe. It's a back-geared, screw-cutting lathe with 16 speeds, reversible power feeds, integral countershaft, V-belt drive, Timken bearings, etc. There are two sizes—12" and 18" between centers—both with 6" swing. There's never been a value like it before.

### Free NEW CATALOG



See the amazing new Small Lathe, the sensational new Metal Shaper, and the complete Atlas shop equipment for metal and wood working. Send for new 1938 Catalog today.

**ATLAS PRESS COMPANY**  
555 N. Pitcher St.  
Kalamazoo, Mich.

# Gus Settles a Family Quarrel

(Continued from page 66)

the door. "Let me try it, Mrs. Snodgrass," he suggested. She got out, the running board groaning under her 250 pounds. "This is *my* car," she said. "That little bantam gave it to me for my birthday. Just get it running, mister, and then tell me how to get on the Lincoln Highway from here. That's all I want!"

"Lincoln Highway!" shouted her husband. "What d'you think you want to get on the Lincoln Highway for?"

"ACCORDING to the road map it runs through Reno," the woman said bitterly. "I'm going to get on it, and stay on it until I get there!"

"Well, now, let's see," Gus said soothingly. He got into the car and pressed the starter with his foot. Again the engine purred smoothly. He got out, leaving it running. "Try again, please, Mrs. Snodgrass," he said. She climbed in—and before she had settled her ample self in the driver's seat the engine had stopped! "I've had just about enough of this monkey business!" she snapped ominously.

Gus slowly scratched his head just above his right ear. Then he leaned over and began fussing with the floor boards. When he straightened up he had one of them in his hand. "Step on the starter—just this once more, Mrs. Snodgrass," he requested.

She did as he asked. The engine started—and kept on running!

Gus laughed. "We've chased out that devil!" he said. He held up the floor board and pointed to a little metal bracing plate screwed to its lower side. "That's him. See what happened? When this floor board is in its place, that metal plate is just over the fly-wheel generator plug. Mr. Snodgrass and I aren't heavy men, so when either of us was in the driver's seat nothing happened. But Mrs. Snodgrass weighs—er—weighs a little more, so when she got behind the wheel the floor boards were pressed down on that side of the car until the metal plate came into contact with the top of the generator plug and grounded on the engine block. Naturally, that shorted the ignition system. You'd better leave that floor board out, Mr. Snodgrass, until you can get a carpenter to do a little job of bracing under that side of the floor."

THE little man was all smiles now. "You're a wonder, Mr. Wilson," he said generously. "You've lived right up to your reputation as a trouble sleuth. How much do I—"

"Oh, nothing—nothing at all," Gus said. "That was a brand-new one on me, and it's restored my faith in the general cussedness of automobiles. When they get all the little devils chased out of 'em, I'll have to look around for another line of business." He turned to the woman with a wide

smile. "Now you can drive anywhere you want to—except maybe on that Reno road?"

The stout woman smiled and blushed as she let in her clutch. "Maybe I'd better go on a diet instead!" she said. "Thanks a lot, Mr. Wilson!"

When Jack Kelly came in for his car late that afternoon, Gus told him about the Snodgrass affair. "Say, Gus," Kelly said admiringly, "doesn't anything ever stump you?"

Gus leaned against his workbench while he crammed long cut into his pipe, and Kelly knew that he was going to hear a yarn.

"Yep, I've been stumped many times—plenty stumped," Gus said. "And it was what you might call an ignition mystery that had me stumped worse than I've ever been stumped before or since."

"When I was younger, ants used to get in my pants—I couldn't have stayed in one place more'n six months to save my life. Well, that was O.K.—I wasn't married, and I never had any trouble finding a job. So when I'd seen enough of one town, I'd just roll along to another one."

ONE spring day, years ago, I was out in eastern Colorado and a friend of mine out there told me one of the queerest motor-trouble stories I think I've ever heard. He had an almost new Dort six, and it was purring along the road one day at maybe forty or forty-five miles an hour, and everything was lovely—except that a strong northeast wind was blowing a lot of dust around.

"He was traveling through rolling country, and pretty soon he noticed that a couple of cars were stopped in a cut a half mile ahead. When he got into the cut his motor went dead. He stepped on the starter, but the engine wouldn't take off. He tried everything he knew—nothing doing. Several other cars came along, and stopped in the same mysterious way. The air was blue with cussing, and no one could get started. Inside of an hour he claimed there were fourteen cars stalled in that cut!"

"Then another funny thing happened. A Model T Ford came along, and its engine kept right on running. The driver couldn't help the other cars to get started, but he did the next best thing—he took one of the men along to a ranch house a couple of miles down the road, where he could telephone to the nearest town for a wrecker. By the time this fellow had walked back to the cut, there were twenty-three cars stalled in it. But a half dozen Model T Fords had gone through without the slightest trouble!"

"After a while the men saw the wrecker coming along the road. It was an old Chevy, and when it got into the cut it stalled. After the mechanic who

(Continued on page 127)



This One



GAXW-XKQ-KGJH



## Gus Settles a Family Quarrel

(Continued from page 126)

was driving it had kicked at his starter for a while without getting any action, he got out and started to pull tools out of the back of the wrecker, cussing because some one had thrown a lot of pieces of chain over them. My friend noticed that he left one length of chain trailing down over the tailboard onto the road.

"THE mechanic fooled with his motor for a while, and then got in and gave his starter another kick. And his engine started! So he threw all his tools back into the car. Then he noticed the piece of chain hanging over the tailboard, and threw that in, too. And his engine stopped!

"That was the tip-off. All of the drivers fastened skid chains or pieces of wire to the backs of their cars, so that they trailed in the road, and they all got started without any trouble. After they'd gone a few miles, my friend got out and put his skid chain back in the car, and she went on running all right." Gus stretched and yawned. "Well, guess it's time for me to go home for supper," he remarked.

"Wait a minute—wait a minute!" sputtered Kelly. "Finish your story. What made all the cars but the Model T Fords stall?"

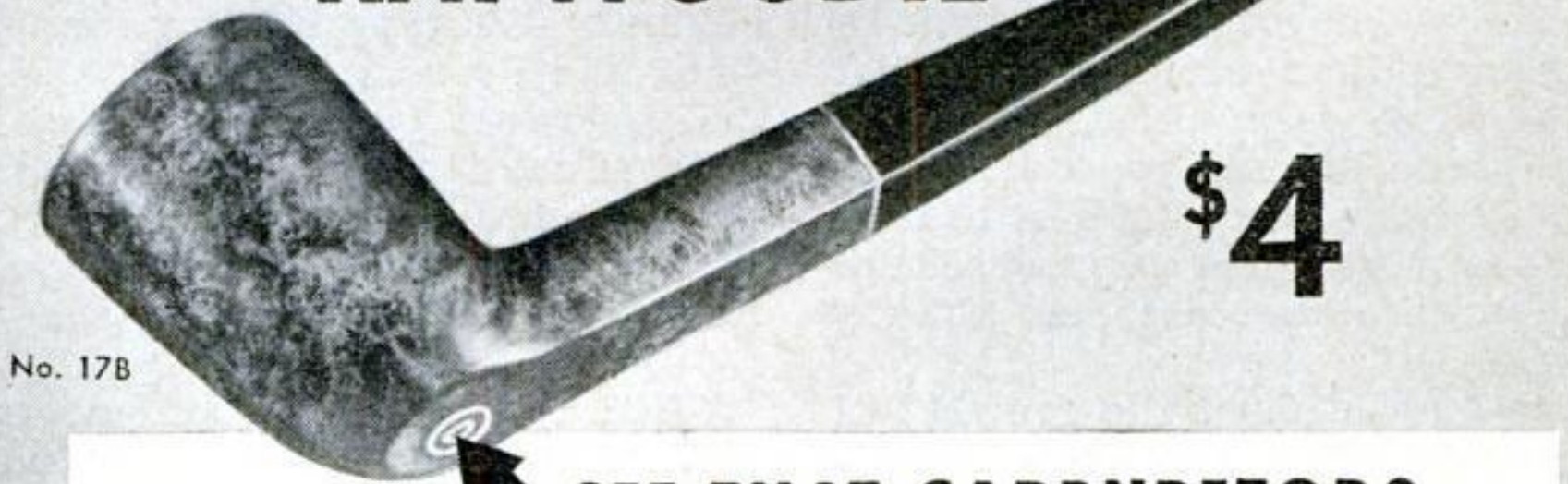
"That's what I couldn't figure out," Gus said. "And it bothered me plenty. So when I got to Boulder I went up to the University of Colorado and told a fellow who taught electrical engineering about my friend's story—half expecting him to think that one of us was a liar. But he said that he'd seen the same thing happen before when there was a stiff wind blowing. Seems that the shifting sands created static electricity that short-circuited batteries, and that the chains or wires hanging out of the cars onto the road grounded it. Naturally, it didn't affect the old Model T Fords—they ran off magnetos, and didn't have any batteries!"

## Highways in Colors To Guide Motorists

HIGHWAYS tinted in pink, blue, lilac, and various other distinctive colors, may be among the roads of the future, if an English plan is carried out. Because there are so many highway signs on modern roads, it is argued, motorists are frequently confused rather than informed by the written directions. When a representative of the British Road Federation suggested to the British Ministry of Transport that lamp-posts and other roadside poles on a certain route be marked in various distinguishing colors, critics declared this would merely add confusion to the already confusing welter of signs and symbols. As an alternative, the critics suggested the use of tinted concrete or asphalt for the roadway itself.

## CARBURETOR KAYWOODIE

U. S. Pat. No. 2,082,106



\$4

### SEE THAT CARBURETOR?

That little patented inlet in the bottom of the bowl does something really worth while, and you'd be surprised how many smokers say so. It's a Carburetor, that lets in an updraft of air that keeps the inside of the bowl dry at all times. The tobacco burns more evenly, produces a better flavor. The harder you puff away at the pipe, the more updraft, so your pipe stays cool *always*, instead of getting hotter. Yessir, good old Kaywoodie quality in every part of the pipe. See it, and you'll buy it.

KAYWOODIE COMPANY • New York and London

## Thompson BEATS the World on BOATS

### Only Boats With Full Length Spray Rails

Keep passengers perfectly dry—even at high speeds. Catalog also shows today's five most popular models of sailboats. Two big factories. Prompt shipment.

CATALOG FREE Write for your copy. State kind of boat in which you are interested.

THOMPSON BROS. BOAT MFG. CO. (87) 219 Ann St. PESHIGO, WIS. Write to either place 119 Elm St. CORTLAND, N. Y.

### Better Built Lower Prices

Canoes \$64 and up  
Rowboats \$42 and up  
Outboards \$42 and up

Very fast utility model

FRONT

BACK

**FOR EVERY TOOL USER**

**\$1.00** Postpaid

Indispensable For  
Mechanics  
Draftsmen  
Toolmakers  
Experimentors

Send for FREE Illustrated Tool Catalog.

**Homecraft Tool Supply Co.**  
Dept. S  
236 Neptune Ave.  
Brooklyn, N. Y.

Dealers: Send for Details

## Midget Portable ELECTRIC OR BATTERY Radios

### World's Smallest Radios

Just a handful—Wt. only 2 lbs.—Size 3 1/2"x5 1/2"—4 tube performance! Midget BUILT IN LOUDSPEAKER and AERIAL—Requires no ground—Hi-efficiency circuit and quality parts. Has Broadcast, short wave and foreign bands! Simple to operate—durable—trouble free. Ideal Radio for Office, Apts., Bedrooms, College, Camps, Trailers, Tourists, etc. Battery model has batteries inside case for use on farms, boats, autos, etc. Electric model uses 110 A. C. D. C. Either model kit of parts for \$6.49—Wired and checked 50c extra or \$6.99 complete ready to listen! Beautiful breakproof cabinets. State Color.

SEND ONLY \$1.00 and pay postman balance on delivery. (Batteries for battery model \$1.79 extra). Free catalogue listing 100 other radios at factory price. Order now! Guaranteed. TINYTONE RADIO CO., PS-5, KEARNEY, NEBRASKA

## SHIP MODELS Alabama

Build a model of Capt. McCann's last project. Complete Kits or separate parts for building a beautiful model of the famous Alabama. We can also supply kits and parts, blueprints and books for many other models. 64-page photographically illustrated catalog mailed postpaid upon receipt of 15c coin.

MODEL SHIP SUPPLY CO. Dept. S Mineola, N. Y.

**A BARGAIN**

**Use it as a Bench Grinder**

**UNIVERSAL GRINDER COMPLETE ONLY \$3.95**

Combines the convenience of a bench grinder with the adaptability of a hand tool. Offered complete with 30 piece arbor tool set at this exceptionally low price.

**INCLUDES 30 PIECE ARBOR TOOL SET**

which consists of 10 assorted sizes of grindstones, assorted engraving or carving burrs, mounted point polishing buffs, screw mandrels, polishing brush and assorted sanding discs, emery, garnet, fine, coarse and medium.

RUSH \$1.00—BALANCE C.O.D.

IT is an indispensable and convenient grinder for shop, model maker or professional man. Hy-speed, hy-power motor develops 10,000 rev. per minute.

HAS wide variety of uses. Compact design, equipped with 3 jaw universal arbor chuck, adjustable to use. Real fine cutters for work on delicate jobs and to eliminate tedious work hours.

EFFICIENCY speeds work, saves time, saves money. Arbor tool set enables you to grind, drill, route, sand or carve. Operates on 110 volts AC or DC. Variable speeds from 10,000 R.P.M. to 500 R.P.M. can be obtained with the use of a rheostat \$2.50 additional.

**50 PIECE UNIVERSAL ARBOR TOOL SET 75c**

Indispensable to Jeweler, Laboratory, Model Maker and Home Craftsman. The ideal outfit for fine accurate grinding, sanding, routing or carving. Includes 12 grindstones with brass centers in assorted sizes, 5 bakelite cut-off wheels, 5 assorted engraving, routing or carving burrs, 2 polishing buffs, 1 mounted point, 2 bristle polishing brushes, circular and cup shape, 3 mandrel arbors, 20 assorted sanding discs of emery, garnet, sand, fine, medium and coarse.

Send Coin or Money Order \* Shipment Prepaid

**PHILA. MACH. CO., (Dept. AS), 118 N. SIXTH ST., PHILA., PA.**

**PHILA. MACH. CO., (Dept. AS), 118 N. SIXTH ST., PHILA., PA.**

**MAIL**

Send me  
☐ UNIVERSAL GRINDER (with 30 piece arbor tool set.)  
☐ 50 pc. ARBOR TOOL SET ☐ RHEOSTAT

Name.....  
 Address.....  
 City..... State.....



# Modern Avocado Groves Bring You an Ancient Fruit

(Continued from page 49)

limbs by removing a section of bark, thus isolating those limbs from the rest of the tree, improves production by causing each limb to bear a heavier crop the next year. Also, controlled fertilization in on-crop years increases an already large crop; but fertilization in an off-crop year, for reasons science cannot explain, decreases an already poor yield.

Less is known about the growing of avocados than about any other American crop. Were you to visit the groves in Dade County, Florida, or on the hill-sides of Southern California, you would find one grower delivering water into furrows for irrigation, another into basins, while a third operates an overhead sprinkling system. A variety of trees thriving on one hill will not produce well on another hill twenty-five miles distant.

**T**HERE are four general classifications for avocados: Mexican, Guatemalan, West Indian, and their hybrids. Fruit of the Mexican type are characteristically small, usually well under a half pound, thin-skinned, nut-flavored, and rich in oil. This type grows only in Mexico and California. The Guatemalan type is large, thick-skinned, and also rich in flavor and oil. It flourishes in northern South America, Central America, Mexico, and California. The fruit weigh from one to four pounds apiece.

The West Indian type compares in size with the Guatemalan, and is also thick-skinned. This type is grown mainly in Cuba and Florida.

Hybrids are propagated in a continuous effort toward improvement. The outstanding hybrid, California's *Fuerte*, is considered to be a cross between the Mexican and Guatemalan types.

**A**BOUT 13,000 acres of commercial avocado plantings dot Southern California's rolling hills. The tree is stocky in appearance because it is usually pruned at a height of twenty or thirty feet, which causes it to produce more abundantly. A member of the laurel family, it is an evergreen, with large, waxy leaves that flicker in the strong sun. The growing area is confined principally to a coastal ribbon extending from Santa Barbara on the north to the Mexican border on the south, a highway distance of 250 miles.

Oddly, only laboratory tests reveal when an avocado is ripe. Since color does not indicate the degree of ripeness on the many varieties, sample fruits from individual groves are carried to the laboratory at picking time. There each fruit is peeled. Half of it is ground and reground in a mortar, and an oil is added to determine the difference in refraction between the avocado meat and the oil. This refraction difference indicates the oil content. Un-

less the samples yield twelve percent of oil, the grower must await later tests before his fruit will be accepted for marketing.

From grove to retail store, avocados are handled as carefully as eggs, for they bruise easily. In the field, ranch workers cut the stem at the base of the fruit with special clippers, carefully avoiding stabbing the skin. Avocados growing beyond the reach of men on ladders are taken with pole clippers, down which the fruit slides through a narrow canvas chute to the base, where it is carefully removed and placed in a field box which holds forty pounds of fruit. These boxes are delivered to a packing house, where attendants record delivery by name of the grower, district, date, quantity, and variety.

Here the field boxes are turned upside down and the fruit is poured into a canvas container, from which it moves on a canvas belt through a cleaner of revolving brushes and cloths, then onto brightly lighted tables, where experienced graders inspect it for shapeliness and freedom from scars.

If a few of the incoming avocados are blotched, they are left on the moving belts to be diverted to a lower grading. Those which pass inspection for "extra-fancy" grading drop into little rubber pockets moving along on an endless chain, and are carried under a revolving wheel rimmed by a metal belt which stencils a brand name on each fruit.

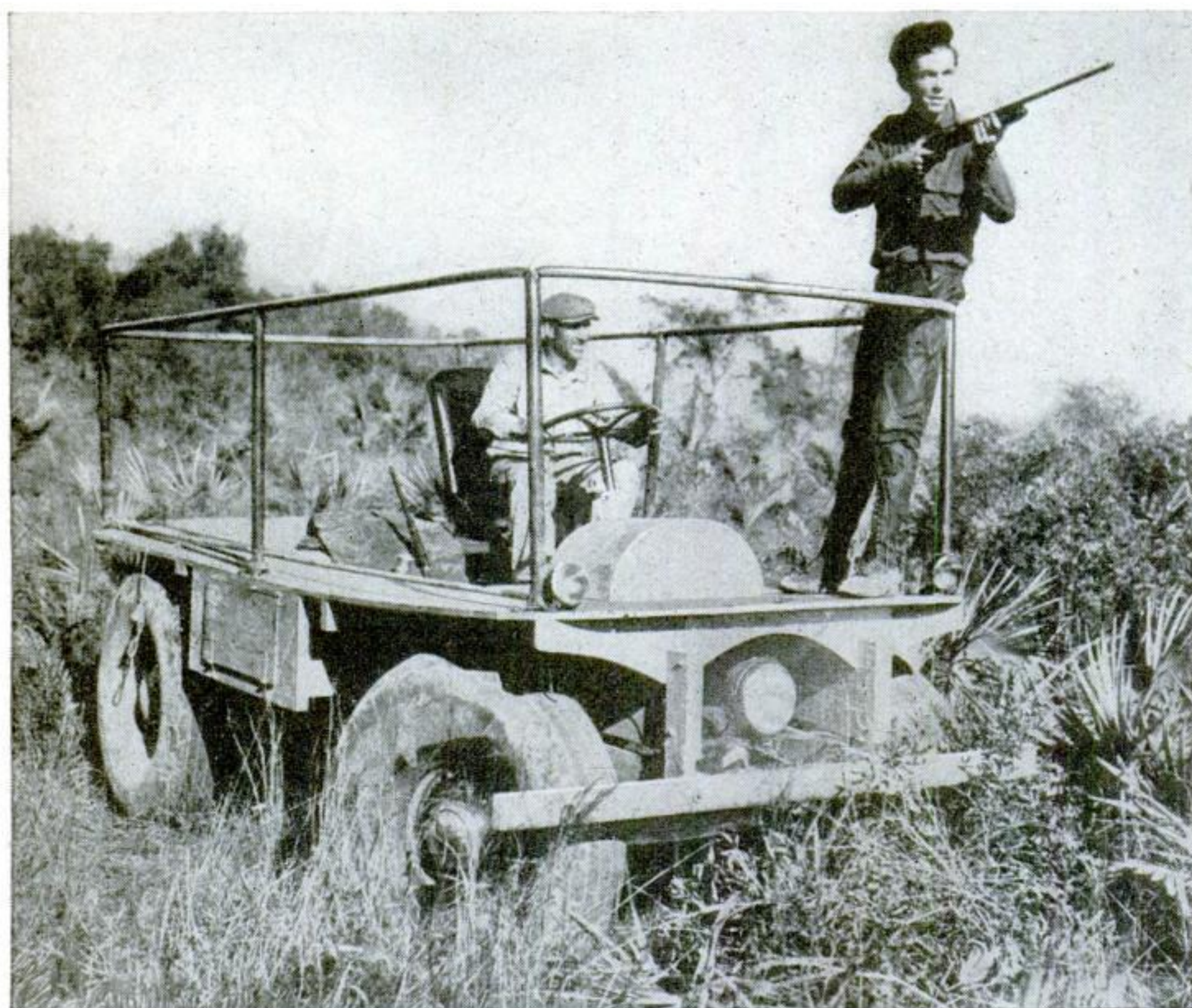
Next, the fruit is separated as to size by a system of graduated weights. Heavier fruit springs trapdoors which permit it to roll into a circular, revolving bin whose floor gradually sinks under the weight of incoming fruit. The smaller fruit springs others traps farther along the line.

**A**T EACH bin, packers place the fruit in even rows in excelsior-lined, open-slat crates which hold thirteen pounds each. Only one variety is run through a grading table for a given packing, so that each box contains a single variety of fruit. After being lidded automatically, the boxes are wheeled into an air-conditioned cooler, where they are kept a full day at forty-two degrees F., before being wheeled into refrigerated trucks and railroad cars for shipment.

In addition to extra-fancy grades, two lower grades are packed. Culls are pressed into oil, which goes into the making of cosmetics in the United States and abroad. A fifth classification, the "cukes," are seedless and resemble large dates. These are offspring of blossoms which failed to pollinate. Rubbery unless fully mature, they possess a high value as novelty fruit.

Unknown to the nation at large a dozen years ago, when the few avocados reaching the public were called alligator pears, this fruit of the Toltecs and Mayans is as new as any food on your table. Science and daring exploration have combined to give it new life and better taste.

## Hunter Rides "Everglades Cruiser"



**F**OR hunting deer, wild boar, and wildcats in the Florida Everglades, Guy Peebles, Miami sportsman, built the odd vehicle pictured above. Called an "Everglades cruiser," it is specially designed for negotiating swamps and can travel through water three feet deep. While a companion pilots the car, the hunter watches for game from an elevated platform

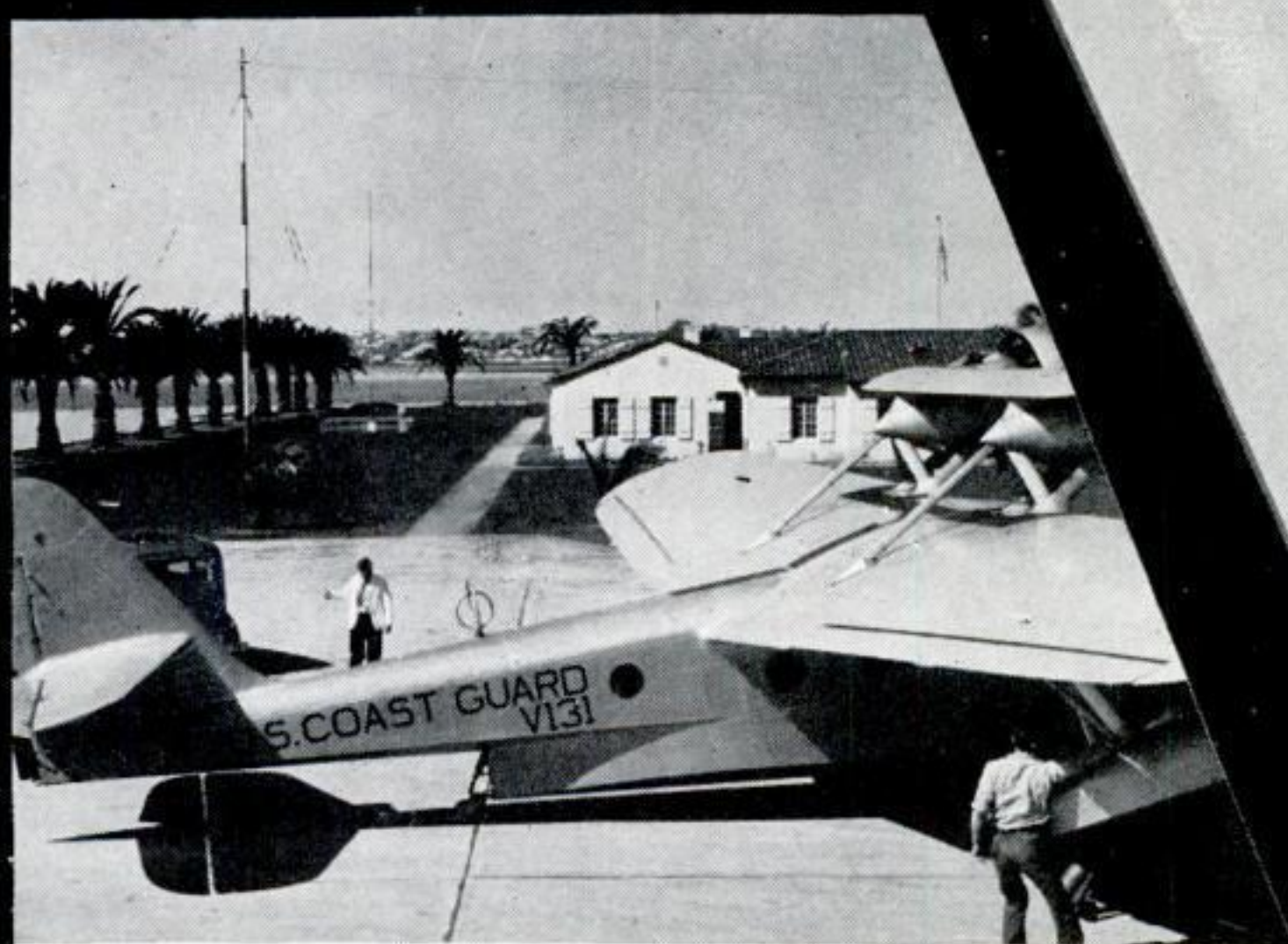


# POPULAR SCIENCE-ON-THE-SCREEN

THE NEWSREEL OF SCIENCE AND INDUSTRY



**Modern functional design** brings dressing room, sitting room and breakfast room to the sleeping quarters. Books, radio, telephone, electric clock, built-in make-up box, set-up for night cap and morning coffee-and-toast are all here within arm's reach.



**The take off**—a shot from one of the most dramatic short sequences ever made—depicting a rescue at sea by the U. S. Coast Guard. Popular Science On-the-Screen is produced in Cinecolor by Carlisle & Fairbanks with the cooperation of the editors of Popular Science Monthly.

*A Paramount Picture*  
AT YOUR NEIGHBORHOOD MOVIE

IN SOUND AND COLOR

Editors of **POPULAR SCIENCE MONTHLY**  
353 Fourth Avenue, New York City

I have never seen **POPULAR SCIENCE-ON-THE-SCREEN** at my neighborhood movie. Your cooperation in having it brought here will be greatly appreciated.

My name \_\_\_\_\_

My address \_\_\_\_\_

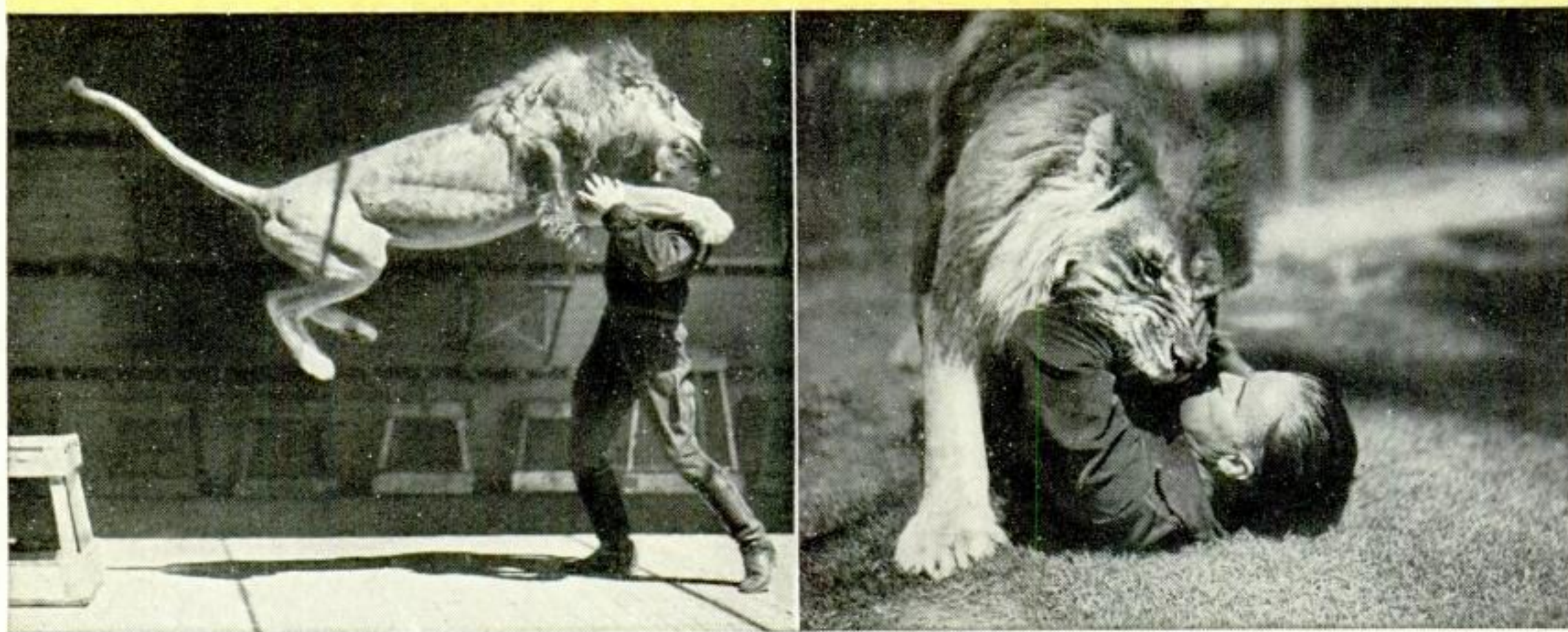
Name of my neighborhood theatre \_\_\_\_\_

Theatre's address \_\_\_\_\_

5-38



MEL KOONTZ—FAMOUS HOLLYWOOD ANIMAL TAMER—WRESTLES A LION!



Here is Mel Koontz alone in the cage with four hundred and fifty pounds of lion. The huge lion crouches—then springs at Koontz. Man and lion clinch while onlookers feel their

nerves grow tense. Even with the lion's jaw only inches from his throat, Mel Koontz shows himself complete master of the savage beast. No doubt about *his* nerves being healthy!

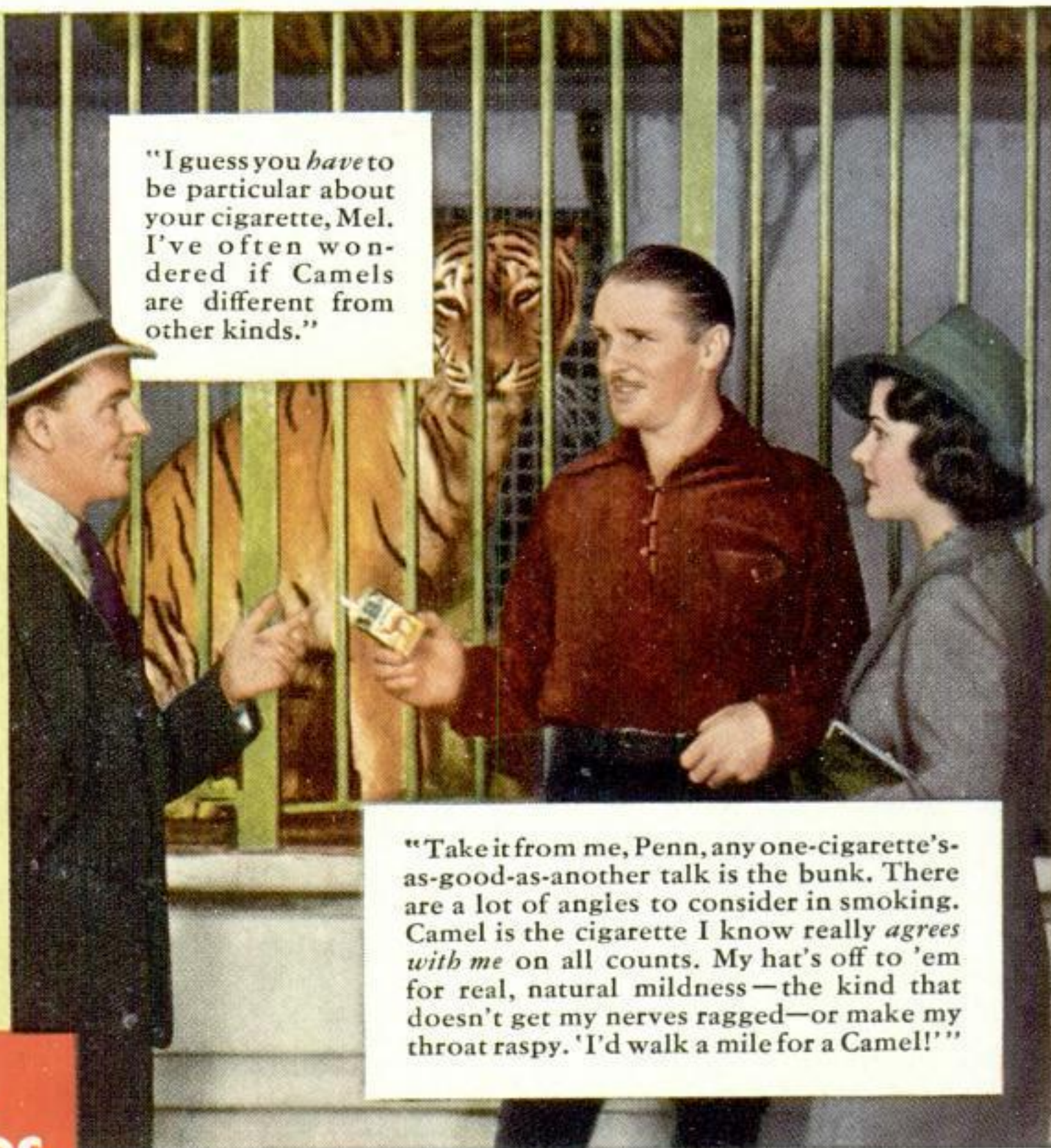
**"I'll say it makes a difference to me what cigarette I smoke"**

says

**MEL KOONTZ to PENN PHILLIPS**

PEOPLE DO APPRECIATE THE  
**COSTLIER TOBACCOS**  
IN CAMELS

THEY ARE THE  
**LARGEST-SELLING**  
CIGARETTE IN AMERICA



"I guess you *have* to be particular about your cigarette, Mel. I've often wondered if Camels are different from other kinds."

"Take it from me, Penn, any one-cigarette's-as-good-as-another talk is the bunk. There are a lot of angles to consider in smoking. Camel is the cigarette I know really *agrees with me* on all counts. My hat's off to 'em for real, natural mildness—the kind that doesn't get my nerves ragged—or make my throat raspy. 'I'd walk a mile for a Camel!'"

**MEL KOONTZ** was schooling a "big cat" for a new movie when Penn Phillips got to talking cigarettes with him. Perhaps, like Mr. Phillips, you, too, have wondered if there is a distinct difference between Camels and other cigarettes. Mel Koontz gives his slant, above. And millions of men and women find what they want in Camels. Yes, those *costlier tobaccos* in Camels *do* make a difference!

Camels are a matchless blend of finer,  
MORE EXPENSIVE  
TOBACCOS — Turkish  
and Domestic



ONE SMOKER TELLS ANOTHER...

**"Camels agree with me"**

**"We know tobacco because we grow it.....We smoke Camels because we know Tobacco"**

**TOBACCO PLANTERS SAY**



"I know the kind of tobacco used for various cigarettes," says Mr. Beckham Wright, who has

spent 19 years growing tobacco—knows it from the ground up. "Camel got my choice grades this year—and many years back," he adds. "I'm talking about what I *know* when I say Camels sure enough *are* made from MORE EXPENSIVE TOBACCOS."

Mr. George Crumbaugh, another well-known planter, had a fine tobacco crop last year. "My best



yet," he says. "And the Camel people bought all the choice lots—paid me more than I ever got before, too. Naturally, Camel's the cigarette I smoke myself. Most planters favor Camels."



"I've grown over 87,000 pounds of tobacco in the past five years," says this successful

planter, Mr. Cecil White, of Danville, Kentucky. "The best of my last crop went to the Camel people at the best prices, as it so often does. Most of the other planters around here sold their best grades to Camel, too. I stick to Camels and I *know* I'm smoking choice tobaccos."

"My four brothers and I have been planting tobacco for 21 years," Mr.



John Wallace, Jr., says. "Camel bought up every pound of my last crop that was top grade—bought up most of the finer tobacco in this section, too. I've been smoking Camels for 17-18 years now. Most other planters are like me—we're Camel smokers because we know the quality that goes into them."

Copyright, 1938, R. J. Reynolds Tobacco Co., Winston-Salem, North Carolina